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Spraying Coal Dust as a Colliery Safeguard

A Description of an Efficient Sprinkling System, with Detailed Costs of Installation and Operation as Carried on in the Mines of Utah

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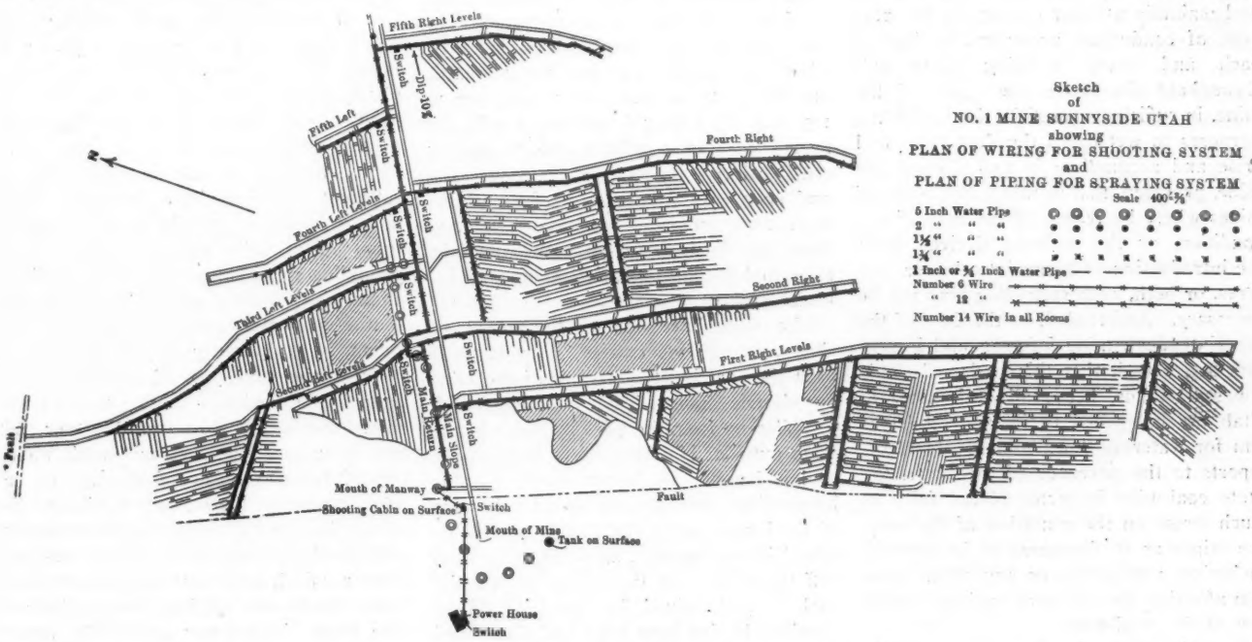
"Man's inhumanity to man makes countless thousands mourn," said Robert Burns, referring to conditions existing a century ago; but the same statement applies very aptly to present-day industrial conditions in the United States and more especially to the coal-mining industry. The occurrence of disaster after disaster in late years in our coal mines, resulting in the loss of many hundreds of human lives, together with the publication of statistics proving that as compared with foreign countries, our coal-mining operations are far more destructive of human life than similar operations conducted by other nations, has awakened the humanitarian instinct of the American people; even the technical and trade journals are seriously occupying themselves in an attempt to discover causes of existing conditions.

At its best, mining is a hazardous occupation and coal mining is probably the most dangerous branch, due to conditions peculiar to the product sought and to the fact that the margin of profit is so small and competition so keen, that only by the movement of maximum quantity at minimum cost, can operations be maintained at all. The presence of explosive gas without coal dust, would, of course, compel any wide-awake manager to adopt all available precautions to protect his men and property; the presence of explosive gas and quantities of explosive dust demands even more careful attention.

Coal Dust Will Explode Without Gas

While the opinions of coal experts throughout the world differ as to whether dust, without the presence of explosive gas, will explode, and scientists bring forth many theories on this question, the people of Utah are absolutely sure that at least some kinds of coal dust do explode and do it without the presence or intervention of even the smallest trace of explosive gas. For over 20 years, the Winter Quarters mines in the east central part of Utah, were operated without encountering a trace of explosive gas, for the same length of time, the mine dust was regarded as absolutely non-explosive; windy, or blow-out shots without number had failed to create even a ripple on the usually calm surface of mining operations and on one occasion, the explosion of 20 lb. of FFF black powder, with fine dust almost ankle deep on surrounding objects, failed to do more than local damage; however, on May 1, 1900, the accidental explosion of a 25-lb. can, or keg, of the same powder precipitated a holocaust in which over 200 human lives were lost. As stated above, not the slightest trace of explosive gas had been seen during the 20 odd years the mine had been worked previous to 1900 nor has any explosive gas been seen there to this day as far as can be learned. Here at least is one case in which gas, unless thoroughly "occluded," cannot be even remotely blamed.

On another occasion, at the Sunnyside mine, some 45 miles distant from Winter Quarters, employees engaged at night on some repairs to the coal crusher used naked lights, and were severely burned by an explosion of coal dust, explosive gas being entirely absent. In the same plant, a 60-in. Steadman disintegrator was completely wrecked by an explosion, opinions differing as to whether the explosion was caused by the accidental intrusion of some giant powder from a car of coal



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coming out of the mine, or whether the finely divided dust within the disintegrator was responsible; later on, in the same plant, frictional sparks induced in the cages of a 60-in. Steadman disintegrator by the entrance into it of an ordinary short-handled shovel, dropped by a careless employee, caused a dust explosion, which burned the plant to the ground. The cause of this explosion was definitely determined to be due to finely divided dust, and here again, gas, as ordinarily understood, can hardly be said to be connected with the affair. The explosion at Winter Quarters, together with these later minor accidents, has convinced the coal-mining population of Utah that dry, finely divided coal in any quantity, either with or without the presence of explosive gas, is dangerous, and may be exploded; measures have been taken to render the mines of Utah safe as far as human ingenuity and human knowledge extend.

Utah Mining Laws

After the Winter Quarters explosion, the Utah legislature at the request of the State coal-mine inspector placed on the statute books the following: "Every owner, agent, manager, or lessee of mines within the State of Utah, shall provide and maintain a water system for the purpose of conducting water to the face of each and every working place and throughout the entire open part of the mine, in sufficient quantities for sprinkling purposes to wet down the dust that shall arise and accumulate in and around the mine, provided, that in mines and parts of mines where by reason of the natural wet condition, or the moisture derived from the introduction of steam into the air currents, or both, such sprinkling may not be necessary. And it shall be the duty of the superintendent, mine foreman and inspectors to see to it that this is done." This law still stands, hence all coal mines in Utah are compelled to install some system for watering down mine dust; in his reports to the governor of the State, the State coal-mine inspector places fully as much stress on the condition of the various mines as to dampness as he does to timbering, ventilation, or any other question affecting the safety or sanitary condition of the employees.

In order to make "assurance doubly sure," the Utah Fuel Company, realizing the dangers to both men and mine from indiscriminate shot firing, has devised and installed in two of its camps a system by which shots are exploded by electricity after all men are out of the mine. This system, which has been operated successfully for several years, almost completely eliminates any possibility of wholesale fatalities such as occur in collieries, and not even the long suffering shot-firer himself need dread the firing of the daily round of shots. As yet there is no law on the statute books of Utah bearing on this subject, but in his report of 1905 and 1906 to the governor, the State coal-mine inspector made the following recommendation: "I would suggest to the Honorable Legislature of the State of Utah, which meets in January, 1907, that they make an amendment to the coal and hydrocarbon mining laws of the State of Utah, as follows: That it shall be unlawful for any miner, or any employee, in the coal and hydrocarbon mines of the State to use, or set off, any high explosive for the mining of coal, or taking down rock, during working hours, as all shots must be fired after the men are out of the mine, excepting those that will be needed to fire the same." While the last legislature failed to enact any law on this subject, it is entirely within the limits of probability that some such measure as above outlined will be placed on the statute books the coming winter; it is to be hoped, however, that the clause *"excepting those that will be needed to fire the same"* will be omitted, and thus *all* human life safeguarded.

Spraying Coal Dust

The Utah coal is bituminous and hard, massive rather than laminated. It is not readily affected by weather agencies, and is of more or less coking character. The following is an approximate analysis: Fixed carbon, 46 to 57 per cent.; volatile matter, 36 to 44 per cent.; moisture at 115 deg. C., 1 to 4½ per cent.; ash, 2½ to 7½ per cent.; sulphur, 0.8 to 1.3 per cent.; calorific power, 5600 to 6000. The coal beds vary from 5 to 25 ft. in thickness, with generally sandstone roof and floor; the dip is from 1 to 6 deg., and the room-and-pillar system of mining is invariably used.

The mines are opened by means of slopes, or of level entries. If a slope is used the coal is let down out of the mine by electric hoists located underground, or pulled up from the mine by steam hoists from outside; if a level entry is used, the coal is handled by horses, or by electric locomotives, usually the latter. In two of the larger camps the coal is not cut or mined in any manner, all shots being fired "off the solid." In two of the camps, the coal is undermined by hand (Sullivan punchers having been tried and abandoned in one of these camps), while in another property, part of the mining is done by hand and part by puncher, the latter being used in the narrow work.

The Dust Problem

As human ingenuity has not yet devised a workable system of mining coal without the production of dust, all of these mines are afflicted with this troublesome substance and in considerable quantities; by common consent, since the Winter Quarters disaster, all dust is considered dangerous, and this fact, together with State law requirements, has led the Utah Fuel Company to install sprinkling systems, each being a parallel duplicate of the others. The letter of the law could easily be carried out and its spirit evaded, as is so frequently done by coal operators, when they use water-carts, or wagons, or similar useless subterfuges, and by so doing, the item of "spraying," on the operating-cost sheet as well as on the construction or capital-charge statement, could be made practically negligible; however, remembering the lesson of Winter Quarters and numerous similar examples in Colorado, Wyoming and other States, the Utah operators installed a spraying system worthy of the name and deserving of reproduction wherever it is conceded that wetting coal dust is beneficial.

Method of Spraying

To properly sprinkle a mine with accessible openings aggregating 50 to 75 acres and advancing at a rate of from 15 to 25 acres opened per year, requires about 20,000 gal. of water per day; such a mine with coal 5 to 8 ft. thick will employ 300 to 350 men and produce 1200 to 1500 tons per 8-hour day. The water should be under a pressure of about 50 to 100 lb. effective head at nozzle, to allow of reducing the water stream to as fine a spray as possible and to give sufficient force to wash all fine dust completely from roof, walls or ribs, timbers, brattice, etc. Where it is possible to do so, this pressure should result from gravity by installing a tank or reservoir at a sufficient elevation above the mine. This tank or reservoir, should have a capacity equal to at least two or three days' sprinkling requirements to insure continuation of sprinkling even if the original source of water supply should, by accident, be temporarily shut down.

From the tank, or other storage receptacle, the feed pipe leading to the mine should not be less than 3-in. diameter and may be larger, depending on length, number of turns, number of streams to be used, grade, etc.; 3 in. is a minimum diameter in order to insure sufficient water with good pressure for at least 3 streams from a 1-inch hose, and in case of mine fire to insure two efficient streams from a 2-in. hose. This latter use of the water system is only incidental, but is clearly worth consideration when contemplating installation.

On the surface, the 3-in. feed pipe should be thoroughly protected from possible accident and from freezing; this is usually accomplished by burying it well under the frost line. The pipe should enter the mine through the return air course, avoiding reverse grades if possible, and should extend into the mine in such a manner as to allow distribution to the working faces with a minimum of laterals. Tees should be placed in this main feed line at selected points, so that

the haulage entries may be reached with auxiliary lines; these tees should have at least a 2-in. opening, and at intervals of 400 or 500 ft. along the main and auxiliary lines, other tees with a 2-in. opening reduced to 1 in., and having a ¾-in. hose bibb, should be placed to be used in sprinkling the entry through which the pipe line runs, as well as any accessible neighboring place. The idea of placing the tee with a 2-in. opening and then reducing it to 1 in., or ¾ in., is to have all parts of the mine so equipped that in case of a mine fire, 2-in. fire-hose connections may be made with minimum delay.

The auxiliary lines into the main haulage entries should be at least 2 in. in diameter, and from this line, 1-in. pipe should be extended into all rooms. In case comparatively short side entries are turned off the main haulage entries, and rooms are driven from these side entries, 1½-in. pipe is sometimes used in the latter entries, and either 1-in. or ¾-in. pipe is placed in the rooms.

Details of the Sprinkling Installation

Gate valves are located at intervals along the main supply line, also on the auxiliary lines where they leave the main line and at intervals along these auxiliary lines in order that possible breaks may be repaired without interference with lines in other parts of the mine, and in order to be able to shut off the flow of water quickly in case of a break. These valves are either placed in boxes which can be locked, or the wheels, which act as levers, are removed and held by the waterman; the levers on the hose bibbs are also removed and kept by the waterman; this precaution prevents useless waste of water and possible damage to the mine by the irresponsible or malicious.

Men are Employed to do Nothing but Sprinkle

The actual work of wetting down the dust is intrusted to one or two men as the case may be, two being required in a mine where 15 or 20 acres are developed per year; these two men have absolutely no other duties, not being called from their sprinkling in any but the gravest emergency. Part of their time will be occupied in making necessary repairs, or extensions, the remainder in sprinkling; or one man may continually sprinkle and one man work on the pipe lines, helping each other when the work at hand requires the services of two.

The waterman carries 150 to 200 ft. of ¾-in. rubber hose which he attaches to the ¾-in. hose bibbs before mentioned, opening the latter with the lever which he carries; he is instructed to thoroughly wet the roof, sides and floor of all accessible openings paying especial attention to the very fine dust near the working faces and along the haulageways. He is expected to keep all dust so damp that when loose material is taken from the floor and subjected to pressure of the hand, the form thus fashioned will retain its shape on removal of pressure; all brattice must be kept damp, brattice on haulageways and manways being given particular attention.

By thus continually and systematically attacking the dust, the latter is at length saturated, a condition impossible to attain by spasmodic sprinkling, using a cart, pail or any other device by which the water must be transported on wheels. Moreover the playing of a finely divided spray under pressure not only settles that dangerous dust which keeps floating in the air, but penetrates dust bodies wherever located, while an attempt to wet them using pail or any other device not under pressure, would penetrate only a thin film of dust on the top, leaving the great body untouched and wasting at least 75 per cent. of the water used.

Spraying Has no Harmful Effect

The introduction of this considerable quantity of water into the mine workings has no visible harmful effect; the roof is not affected as it is by the introduction of steam into the intake air, and evaporation prevents any undue accumulation of seepage; the parts of the mine traversed by return air are kept moist by the condensation of moisture-laden air, thus insuring the elimination of dust deposits in those parts which are abandoned, but through which air currents must be sent. Objection to sprinkling has been made on account of the probability of causing spontaneous combustion, but not a single case has been reported, mine fires in Utah being almost unknown. This latter result is probably due to the fact that all parts of mines are kept damp, and the absence of heat thus prevents spontaneous combustion even where iron pyrites abounds; moreover, no fine coal is left in the mines except that which enters into the air temporarily, that which sifts from cars during handling and the small quantity which the miner fails to load out.

Cost of Installation

The cost of installation of a complete and effective sprinkling system will, of course, vary with the surrounding conditions, such as the extent of present mine workings, distance of water supply from the mine together with cost of bringing the water to the pit. We must also consider the possibility of getting elevation for a gravity head. As installed at Sunnyside, Utah, No. 2 mine, where partly pump pressure and partly gravity pressure were used, the cost was about $7000, of which $1500 was for labor and $5500 for material. The labor charges included $370 for carpenter work in building a 50,000 gal. redwood tank, and a 12-ft. timber trestle under same; $230 was expended in excavating for, and in building the tank foundations; the total labor cost on the surface, therefore, was $600. The expense incurred in placing the foundation for the 16x5½x10-in. Worthington duplex pump in the power house, also putting the pump on the foundation and connecting to the steam and water pipes was $175. The cost of laying 3000 ft. of 3-in. pipe, 1000 ft. of 2-in. pipe, 20,000 ft. of 1½-in. pipe and 17,500 ft. of 1-in. and ¾-in. pipe was $725. Carpenters received $4.50 per eight hours; masons, 50c. per hour; mechanics setting pump, laying pipe, etc., 37½c. per hour, and common labor, 25 and 27½c. per hour.

Material included the following, f.o.b. Sunnyside, Utah: Fifty thousand gal. redwood tank, 24 ft. diameter at bottom, 23 ft. diameter at top, and 16 ft. high, complete with bands, $625; timber for trestle under tank, and lime, sand, etc., for walls was $275; the 16x5½x10-in. Worthington duplex steam pump and fittings cost $825; pipe, fittings, etc., as enumerated above, totaled $3775.

The complete installation, therefore, cost about $7000, and was suited for a mine producing annually about 300,000 tons; if this installation were charged directly to coal output and distributed over a year, the cost would amount to 2⅓c. per ton; if distributed over five years, the cost would be less than ½c. per ton. The installation at Castle Gate, where the annual production was also about 300,000 tons, cost slightly more than $7000, while at Winter Quarters, where the annual output is 350,000 tons, and at Clear Creek with 350,000 tons, each installation cost considerably less than $7000.

The annual cost of operation at Sunnyside including both No. 1 and No. 2 mines with 630,000 tons production is as follows:

ANNUAL COST OF OPERATION.

Wages 2 pipemen and 2 watermen at $2.75 per day for 275 days	$3025
40,000 gal. water per day for 275 days at 12c. per 1000 gal	1320
Labor, running pumps, supplying steam for same, etc.	550
6 per cent. interest on investment of $14,000	840
Depreciation 10 per cent	1400
Extensions, repairs, hose, etc. (miscellaneous labor and material)	1000
Total actual operating cost yearly	$8135

As mine-cost sheets take no account of interest and depreciation, the total yearly operating cost to appear on cost sheet will be $5895, which on a yearly tonnage of 630,000 will amount to less than 1c. per ton; where water is plentiful and the gravity system may be used, the cost per ton for operating will be less than ¾c. per ton, certainly not an item to discourage any operator.

If this system was installed at the time of opening the mine, $2500 would suffice in any ordinary locality, and extensions could be made to keep pace with development, and be charged out to coal production without creating any particular notice. These extensions in a newly opened mine producing about 500 tons per day, or 11,500 tons per month in a seam 10 ft. thick where development is being rushed, will

amount to about 60 ft. of 3-in. pipe monthly, costing $15, 300 ft. of 2-in. pipe in main haulageways costing about $40 each month, and 700 ft. of 1-in. pipe with a monthly cost of $40; this makes a total of $95, or about 4/5c. per ton. This cost would probably increase slightly until such time as retreating work is begun, and then the time will soon come when the pipe recovered will amount to as much, or to more than the pipe extended; when this occurs, the total cost of spraying will be reduced to less than 1c. per ton, as shown above at Sunnyside.

Miners who have been employed in Utah mines and later go into neighboring States to work, are horrified at what they freely term the criminal neglect and carelessness of coal operators, and many of these miners refuse to work in the dry and dusty mines. Mine owners in Utah place such stress on effective spraying, that they have been known to close down a mine producing over 1000 tons daily until frozen water pipes have been thawed to permit resumption of sprinkling. The mine manager naturally hesitates to add 1c. per ton to his cost record, and directors and stockholders are not fond of parting with 1c. per ton on a large production, where the aggregate cost often totals several thousand dollars annually; however, when these operators and mine owners recall the bitter experience of Winter Quarters and other mines where the money loss to the company amounted to several hundred thousand dollars, without considering the human suffering entailed and the prestige lost, the added safety obtained by thorough spraying together with anxiety spared all connected with the company, generally causes the coal magnate not only to be reconciled to the addition of 1c. per ton to his cost sheets, but even to be thankful that by having done so, he has probably escaped paying a far heavier tribute to the gods of destruction. This article will be followed by a description of the modern system of firing all shots electrically in the Utah mines.

Safety Lamps in the Coal Mines of Foreign Countries

The Commission on Illumination, appointed by the Société de l'Industrie Minérale, begins its report, in the *Bulletin* of March, 1908, with a review of the laws of the several coal-mining countries of Europe relating to the use of safety lamps.

In France a safety lamp of standard and approved type is obligatory in all coal mines, except that a naked flame may be carried into a downcast air shaft. The safety lamps are supplied by the operator, and each one has a number, a record of which is required to be kept by the proper official on the surface. Each workman receives his lamp cleaned, burning and in perfect condition; if it is found subsequently open or out of order, he is held responsible and is disciplined.

In Austria naked lamps are forbidden except in downcast air shafts. The type of safety lamp required to be used burns benzine, has two gauzes, a magnetic lock and a magnetic relighter. Portable electric lamps are also permitted. All lamps are officially inspected once a year.

The Cost of Electric Lamps Has Hindered Their Adoption

In Germany the rules are similar except that portable electric lamps are permitted only under the same conditions as are naked lamps. The price of electric lamps and the cost of maintaining them have thus far hindered their wide adoption. Safety lamps have one or two gauzes, according to the places in which they are to be used. They do not have the mantle.

In Belgium naked lamps are forbidden in all coal mines whether gassy or not. In moderately gassy mines safety lamps of well known types and portable electric lamps are permitted. The former are required to have the mantle, but its condition of fixedness is optional with mine managers. Only phosphorus relighters, ignited by friction, are permitted. Relighting stations are located near downcast air shafts.

In Spain safety lamps are compulsory in gassy mines and incandescent electric lamps are permitted under certain conditions of isolation and protection. Arc lights are not allowed.

In England safety lamps are not demanded except in such parts of a mine as shall have "a dangerous proportion of inflammable gas," which loose terms leave a good deal to personal discretion. In Wales, however, naked lamps are very rare. The mantle, without being compulsory on a safety lamp, is widely used, even on lamps with but a single gauze, and workmen are generally forbidden to lift the mantle. Electric lighting is permitted under certain safeguards.

Accidents in Coal Mines

According to estimates made by the Geological Survey, there has been a falling off in the number of deaths in coal mines for the year 1908, and the number of deaths will be several hundred less than in 1907. In that year more than 3125 men were killed in the coal mines of the country—a death rate of 4.86 for every 1000 men employed—from three to four times as many men per 1000 as are killed in any coal-producing country of Europe. In December, 1907, four explosions caused the death of 700 men. During 1908 there were but two accidents in which the loss of life was heavy; one in January at the Hanna mine, in Wyoming, with a loss of 70 men; the other, Nov. 28, at the Marianna mine, in Pennsylvania, which resulted in 154 deaths.

All Explosives to be Standardized

The experiment station at Pittsburg announces that much of the danger heretofore experienced is due to the so-called "safety" explosives. It is the purpose of the Government to continue these experiments until the explosives of the country are standardized in such a manner that the miner will have a definite idea what these explosives will do. After the Government has gone far enough in its experiments, a bulletin will be issued recommending as permissible explosives, such as stand the test.

The Survey is also laying stress upon experiments said to show that coal dust is an explosive as dangerous as firedamp. The officers at the Pittsburg station are seeking to find some method by which this dust can be prevented from being a serious menance. These investigations are expected to accomplish a reduction in the number of men killed in the mines, and a saving of the waste in mining coal. The use of improper explosives, as well as the improper use of suitable explosives is said to result annually in the waste of great amounts of coal. The use of too high charges in blasting, or the use of unnecessarily violent explosives, shatters much good coal, converting fuel into dust which may itself be explosive and become productive of further damage. Such explosions often loosen the roof of a coal mine, causing falls of top rock, and resulting in increased fatalities.

West Africa, the Gold Coast Colony and Ashanti in 1908

By W. Fischer Wilkinson*

The gold production during 1908 will amount to a value of about £1,183,000, which is somewhat in excess of that obtained in 1907. No new mines are crushing and the increase is mostly due to the Taquah mine, which milled the whole year, while in 1907 its production was limited to the closing months.

The accompanying table gives a list of the principal mines showing the approximate results obtained, the returns for December being necessarily estimated.

Taquah and Abosso Mines

The Taquah mine, which heads the list, commenced regular crushing in September, 1907. This mine is working banket ore. The mill of 50 stamps is run by a gas engine and producer plant, the first on the coast; the plant is reported by the gen-

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eral manager to be an unqualified success. For the period September, 1907, to June, 1908, the 50-stamp mill crushed 46,234 tons (2000 lb.) for a return of gold of the value of £162,243 or 68.36s. per ton. During this period the mill ran only 59.55 per cent. of its possible full time owing to want of ore and breakdowns of the old machinery in use. The costs, including development redemption (6.5s.) and London expenditure (2.4s.) but not depreciation, were 42.1s. per ton milled. With better running time the costs will no doubt be less but the grade seems high compared with the other mines along the banket section. The ore reserves are given as 233,941 tons, value not stated, but they include 176,971 tons assaying 21.6 dwt. The greater portion of the profit made has been spent on capital expenditure, and no dividend for the financial year is paid, but the directors announce an interim dividend of 10 per cent. for 1908 payable in January, 1909.

GOLD COAST, 1908.

Company.	Stamps.	Tons.	Value.	Value per Ton.
Taquah	50	62,803	£216,788	68s.
Ashanti Goldfields	40	62,285	156,753	50
Prestea, Block "A"	50	89,643	153,489	34
Abosso	50	48,761	115,453	47
Abbontiakoon, Block 1	50*	65,280	114,333	34
Broomassie	20	19,547	111,607	114
Bibiani	45	49,876	97,531	39
Wassau	40	62,200	86,664	28
Akrokerri	40	33,660	61,677	
Dredging and other small producers			67,771	
			£1,183,066	

* Ball mills equivalent.

The Abosso mine, which is managed by the same men as the Taquah, has a 50-stamp mill, 20 having been added in February, 1908. During the financial year ending June 30, 1908, 44,021 tons were crushed, the recovery value being 50.4s., and the costs, including development (5.25s.) and London expenditure (1s.) but exclusive of depreciation, 35.2s. per ton milled. The costs were above the normal owing to a series of accidents at the mine, the lower levels being more than once flooded. The ore reserves at June 30, 1908, were estimated at 210,801 tons of 18.7 dwt. value. The dividend is the same as last year, namely 10 per cent.

Ashanti Goldfields Corporation

The Ashanti Goldfields Corporation showed a net profit for the year ending June 30, 1908, of £34,646, most of which was spent on capital expenditure, so that no dividend was declared. The company operates a group of quartz mines round Obuassi and treats the ores partly by wet stamp milling and cyaniding, and partly by dry crushing, roasting and cyaniding. For the 12 months ending June 30, 1908, there were crushed wet 43,135 tons, and dry 16,021 tons, total 59,156 tons of a total value of £171,033 equal to 56s. per ton. The costs are given as 25s. 1d., made up of ore extraction and timbering 7s. 1d., treatment 10s. 11d., general charges 7s. 1d., but excluding development, London expenditure, depreciation and sundries which total up to another 16s. per ton, making a total cost of 41s. per ton compared with 40s. during the previous year.

The event of the year was the discovery by J. N. Justice and since called "Justice's Find," of a large orebody composed of a soft oxidized and decomposed schistose rock turning in depth (below the zone of oxidation) into a fairly hard basic rock still showing schistose structure, highly impregnated with pyritic mineral chiefly arsenical, and carrying fluctuating, but payable, quantities of gold. No. 1 level, which is about 35 ft. from the surface, over a length of about 400 ft. crosscuts across the deposit have given the following results: 61 ft., 21.2 dwt.; 80 ft., 12.7 dwt.; 83 ft., 11.5 dwt.; 68 ft., 11 dwt.; 69 ft., 7.6 dwt.; 77 ft., 35 dwt. and 66 ft., 17.4 dwt.

How far the value is maintained in depth is not yet known, but the indications in No. 2 level, 100 ft. vertical below No. 1, are promising. Enough work has, however, been done to allow of estimates being made of a large tonnage of 14-dwt. ore being available which can be cheaply won by open workings. The ore is refractory and the great bulk of the gold cannot be detected by simple panning, which may be the reason why the deposit was not worked by the natives. Although refractory a good extraction is obtainable, without roasting, by sliming and filter pressing. In consequence of this fortunate and unexpected discovery an extension of the plant is now being considered.

Other Producers

The Prestea Block "A" mine made a large gold production, but a yield of about 34s. does not allow of much margin of profit as costs are at present. In the November report it is officially stated that notwithstanding present conditions the mine is paying its way, so probably the costs are about the yield figure. Improved results are expected when the railway connection with Tarkwa is completed, the completion being expected next autumn.

The Abbontiakoon Block 1, the Bibiani and the Wassau have also grades of ore that cannot leave much profit, if any, judging by the costs of the other mines. The Broomassie mine with 20 stamps treats very high-grade ore. For the year 1907 bullion to the value of £73,085 was recovered, an amount which was balanced by cost of working, development redemption, depreciation and London expenses. The working costs for the first three months of 1908 but excluding development and depreciation, were in round figures 30s. per ton. The returns for 1908 show a considerable increase.

Outlook

Looking at the results obtained at the different mines, it will be seen that the results of the year were not very profitable, yet there is a promise of better results in the future. The industry continues to gain by experience, and costs are certainly coming down. Gold undoubtedly exists in large quantities and over a wide area and if only the cost of working can be reduced to 20s. a ton instead of 40s. a ton as it now appears to average, when development redemption, depreciation, etc., are allowed for, a prosperous future awaits the industry.

In spite of the disappointing results that the country has given to those who have put their money into mines, there are not wanting those who have faith in a large reduction in working costs being possible. It was announced late in the year, an announcement that caused great activity in the "Jungle" market, that the Consolidated Goldfields of South Africa, which is already interested in the New Gold Coast agency and the Cinnamon Bippo mine, which was reopened last August, was providing working capital for three mining companies in the Wassau district, the Effuenta, the Fanti mines and the Wassau West Amalgamated.

An event of the year that needs notice is the discovery of petroleum in southern Nigeria. A company was formed to work it. A discovery of oil is also reported on the Gold Coast about 30 miles from Axim.

GOLD PRODUCTION OF GOLD COAST COLONY AND ASHANTI, SINCE 1880.

Year.	£	Year.	£
1880	32,865	1895	91,497
1881	45,240	1896	86,186
1882	61,188	1897	84,797
1883	52,435	1898	63,837
1884	66,188	1899	51,299
1885	89,981	1900	38,006
1886	74,878	1901	22,186
1887	81,168	1902	96,880
1888	86,510	1903	254,790
1889	103,200	1904	345,608
1890	91,657	1905	657,330
1891	88,112	1906	877,568
1892	98,805	1907	1,154,885
1893	79,099	1908	1,182,000
1894	76,795		

Water should not be allowed to drop down an upcast shaft, as it retards ventilation. In down-cast shafts the dropping water cools the air, but may increase the moisture in the air even to the saturation point. If the stopes are warm the cooling of the air is less beneficial than the saturation is detrimental.

Alluvial Working at Addison's Flat, New Zealand

By A. Gordon Macdonald*

At Addison's Flat, about eight miles south of Westport, there are several alluvial claims worked by a system of hydraulic sluicing, the tailings being elevated by means of a "back balance."

The gold occurs in several leads at or near the bottom of the alluvial wash, which is about 50 ft. thick. The leads run in an approximately north-and-south direction. The bedrock is a blue, marly clay of Lower Miocene age,[1] known locally as "marine bottom," or "blue reef." On this rest layers of black sand and fine gravel, of marine deposition, varying in thickness up to 20 ft. It is this part of the alluvium that contains the leads of gold. Overlying this fine wash is a deposit, from 20 to 30 ft. thick, of coarse granite boulders. This portion of the wash contains little gold.

In the early days of the district these leads were worked by sinking shafts to them and then removing the richest portions by driving, the gravel being hoisted through the shaft; as soon as the leads began to get poor, they were abandoned. Some time later they were again worked, this time by driving tunnels to drain the workings. Generally two of these tunnels, one on each side of the old, original drives, and more or less parallel to them, were driven to work each lead. In time these were also worked out and abandoned. Some timbers used in these workings can be seen in the present working face.

At the present time water has been brought to the claims, and the whole of the ground, excepting a few "duffer bars" between the leads, is being sluiced away. The water is brought to the edge of the workings by a flume, and is then led by pipes to the face, thus giving a head of about 50 ft. This presure is sufficient for hydraulicking the gravel, but obviously insufficient to elevate the tailings by means of a "blow-up" or hydraulic elevator. Hence the back balance is used to hoist the coarse tailings out of the pit.

As many as possible of the large boulders are thrown to one side, the rest being sluiced down a launder about 200 ft. long, placed in a cut in the bed rock and lined with wooden blocks. From this sluice the gravel passes over a flat, punched screen about 12 ft. long by 3 ft. wide. The coarse material passing over the screen is delivered into a fixed iron hopper, called locally a cage, which is in the form of an inverted truncated pyramid, with a double iron door at the bottom, controlled by a lever. From this hopper these coarse tailings are loaded into a car and elevated by the back balance.

The Back-balance Hoist

The back balance is worked on an inclined double tramway, up which the truck, having a capacity of from 18 to 20 cu.ft., is hauled by a water tank, the two being connected by a steel-wire rope, which makes several turns around the brake drum at the head of the incline. The angle of inclination of the tramway is about 30 deg. from the horizontal, and the axis of the brake drum is perpendicular to the plane of the tramway. The length of the incline is about 120 feet.

The truck comes down underneath the hopper, and is filled with tailings by opening the bottom doors. At the same time the tank is being filled with water at the top of the incline by means of a 12-in. pipe fed from a cistern. When full the tank, weighing more than the loaded truck, hauls up the truck filled with tailings. On reaching the top the truck is disconnected and run out to the dump. Another truck is immediately hooked onto the rope, and filled with water from another 12-in. pipe. When the tank reaches the bottom an arm, connected with a door in the bottom of the tank, strikes a horizontal wooden bar, thus opening the door and emptying the tank. The truck filled with water then descends, hauling up the empty tank. Another cageful of tailings is now discharged into the truck and is hauled up as soon as the tank at the top is filled with water. By this means about 30 truckloads of tailings can be disposed of in an hour.

The water used for filling the truck and tank is not wasted, but is run, together with the fine material passing through the hopper, over the gold-saving tables, which are about 800 ft. distant from the hopper,

THE "BACK BALANCE" IN OPERATION

THE BOTTOM OF THE INCLINE, SHOWING TANK AND HOPPER

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[1]Alexander McKay, report on the geology of the southwestern part of Nelson and the northern part of Westland, p. 56.

the two points being connected by a tunnel. The tables are arranged in five steps. Each step is 48 ft. wide by 3 ft. long in the direction of flow, with a baffle board and well, 8 in. wide, between each step. The total fall is 21 in., or a little more than 1 in. to the foot. The tables are covered with blanketing to give a better surface for catching the gold. To get rid of the tailings from the tables a tunnel over 2000 ft. long has been driven through

TOP OF INCLINE, SHOWING BRAKE DRUM AND TANK-CAR FILLING

the "blue reef." This tunnel discharges the tailings into a creek.

Eight men work the claim; three in the face sluicing the ground, two at the hopper, and three at the head of the incline running the back balance and dumping the cars. In the evening all the men go to the tables, take up the blankets and wash them in two tubs, placed on rails to facilitate the work. The concentrates thus obtained are treated in the amalgamation barrel. Quicksilver and caustic soda are added and the charge is mixed, the barrel being run by a small water wheel, until the blankets are again washed, which is usually every 24 hours.

Notwithstanding the fact that the best of the leads has been worked out, that the tables do not make a high saving of gold, that amalgamation does not give a high percentage of extraction from the concentrates, and that only three of the men are engaged in sluicing down the dirt, the remainder performing what might be called dead work, the claim is giving good results, paying, on an average, £4 a week per man.

Rhodesia is expecting a boom in copper, consequent upon the success of the Edmundian copper mine.

The output of gold from the Gold Coast Colony, including Ashanti, for October, 1908 was 24,552 ounces.

Smelting Progress in California

SPECIAL CORRESPONDENCE

A conference has been held between the board of supervisors of Contra Costa county, Cal., representatives of the Selby Smelting Company, the Peyton Chemical Company and the Mountain Copper Company, and certain citizens of districts which had complained of smelter fumes from the smelting plants of these companies. As a result the smelting companies have been granted 60 days time in which to install appliances to prevent the distribution of damaging gases. This is in compliance with a recent ordinance passed in the county in the interests of certain farming districts, where it was claimed that vegetation was being injured. At the conference referred to the representative of the farmers declared that it was not the intention to force any hardship upon the smelting interests. The smelting men declared themselves ready to meet the requirements of the new ordinance. They wanted 90 days time but this was reduced to the 60 days.

What was formerly the Oakdale Ore Purchasing Company and is now the Richmond Reduction Works, has purchased the buildings of a foundry at Point Richmond, on San Francisco bay, where there is connection with both rail and tidewater. The buildings have been remodeled to suit the requirements for handling ores, concentrates, etc. The company is purchasing sulphurets, chlorination tailings, etc., in the Mother Lode counties of California and elsewhere, and treating them at Point Richmond.

Aluminum and Electrical Work

According to J. T. W. Echevarri in a paper recently read before the Institute of Metals, the price of aluminum now ranges from £65 to £100 per ton, which gives a wide and increasing field of usefulness. The saving that can be effected by substituting aluminum for copper for overhead conductors is so large that in countries where long overhead transmission lines are common the lighter metal is preferred. At its present low price, the author believes there is an extensive field for the metal for insulated underground cables. For busbars and back connections in switchboards it is already being increasingly used.

GENERAL VIEW OF THE WORKINGS, ADDISON FLAT, NEW ZEALAND

In 1907 four tons of silver ore, containing 2959 oz. silver were produced from the Perran mine in Cornwall. This was the only producing silver mine in the United Kingdom.

Developments in Gold Dredging During 1908

The Year Was a Prosperous One in the Industry and Witnessed Great Activity in California and Important Progress in the Klondike

BY JOHN POWER HUTCHINS*

The year 1908, one of strained financial conditions, had no bad effect upon the operation of gold dredges. On the contrary, there seemed to be unusual prosperity in comparison with mining other metals than gold, for mining for other metals was very seriously affected by the fall in prices. Gold dredging, in having an unlimited demand and a constant price for its product, is surely an attractive kind of mining.

The hard times interfered with progress in searching for and equipping new dredging enterprises, although there was a healthy search for new ground and this search was rewarded in several instances by finds of good ground.

Ground that can be worked successfully with floating dredges is hard to find. The most common drawback is a lack of sufficient gold. It is remarkable that there are so many areas containing only a few cents per cubic yard immediately adjoining ground which furnished rich diggings. Many instances can be cited of creek valleys having all the essential characteristics of dredging deposits except sufficient gold surrounded by old bench diggings with records of wonderful yields. There are also numerous creek gravels with sufficient gold, as compared with California dredging fields, but lacking the features that would make it possible to exploit them with floating dredges. There is usually too low a content of gold or if there is more than a few cents per cubic yard there are big boulders, or hard, rough bedrock, or too much clay, or hostile environment or some other factor to raise dredging costs to a prohibitive level.

There is at present an intensive search for new dredging fields and with good results. Countries possessing cold climates and frozen ground are attracting greater attention. It is probable that the search now being conducted in Siberia will result in developing important dredging fields. A similar activity is noted in tropic South America. Colombia is under investigation, and it is probable that several dredges will soon be installed there. There have been many dredging failures in South America, but only recently has a first-class modern dredge of California type been installed in that continent. This dredge was built on the Atrato river and is now being moved to the ground where it will be operated.

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California

Dredging was generally prosperous in the United States. California showed a healthful condition. Some very powerful dredges of large capacity were built and these are doing profitable work in ground that only a few years ago was thought to be undredgeable. Dredging at Oroville had no unusual incidents. A number of the older dredges were scrapped. The Anti-Débris Association was active and enjoined dredging operations where no real damage was done. The city of Oroville enjoined one dredge company which carried on work in the river in a way supposed to cause choking of the river bed so as to give trouble during freshets. There was more or less agitation in cities situated on other rivers in which dredging is carried on. As a notable instance, Sacramento took steps to investigate alleged damage done by the dredges near Folsom. None of these dredges work in the river, and the only possible damage that can be done is by the inconsiderable amount of material held in suspension in the water that runs from the dredge ponds. This probably amounts to not many hundredths of an ounce per gallon of water and it is of such character that it will not settle where there are no river or tidal currents.

The first large dredge to be installed in northern California began operations. This is the first large dredge to begin work in California in gravel differing from that at Oroville and at other places on the flanks of the Sacramento and San Joaquin rivers. The dredging province of California was extended somewhat by the investigation of rivers tributary to the San Joaquin and formerly considered undredgeable.

Montana

Some interesting dredging was done in Montana, furnishing an opportunity for a comparative test of a remodeled dredge fitted with gold-saving tables. This dredge formerly had a sluice box. It is reported that dredging the tailings from the dredge in its original form with the remodeled machine yielded a recovery of 5 per cent. of the original saving. This is about the same as that found in drilling the tailings to ascertain their gold content and is noteworthy. The sluice box was supposed to be less efficient as a gold saver than the tables, resulting in a considerable loss. These figures show that the loss was inconsiderable, and it is not improbable that, had the tailings been worked a second time by a sluice-box dredge, an equal saving might have been effected.

There is, unfortunately, still uncertainty as to the relative merits of sluice box and table, the relative merits of which are not easy to determine. Any procedure to gain knowledge is expensive, and it is extremely difficult to make accurate determinations when handling large volumes of material as in dredging. The gold dredge with the largest buckets in the world, 15 cu.ft. capacity, is owned by the same company. This dredge has a sluice box, and by reason of recent experience with the remodeled type and of other, though minor, considerations, it will not be immediately changed to the table type.

A gold dredge is being installed near Butte. It will operate in material that is by some mining men not considered to be placer material in the limited sense of the word. The ground has some peculiar characteristics, and the operations of the dredge will be watched with considerable interest. Montana has large areas of ground which may, on investigation, prove to be dredgeable.

Idaho and Colorado

Dredging was carried on in Idaho with success. In one instance ground worked several times by hand is now being dredged. In this area the richest returns are often obtained in the ground which has seemingly been most thoroughly worked by hand methods. In one place, an improved dredge is being installed on ground that has been idle for three years after being dredged for five years.

A similar change is reported in Colorado where dredges failed in the early days, and at present modern powerful dredges of large capacity are working successfully. Two dredges originally located in Clear Creek were moved, one to a place near Breckenridge, Colo., and the other in Calaveras county, California.

The Klondike.

Dredging in Klondike made important progress during 1908. Steam thawing was practiced on a large scale and at a lower cost, and less difficulty was experienced. Ground with a high gold content was found, and stripping accompanied with drainage so as to lower the water level produced progressive thawing. It

is expected that this stripping and draining will, after a time, make it unnecessary to use steam thawing except in rare cases. Thawing will (it is thought) progress deeper each summer until it reaches bedrock and the ground will then remain unfrozen. There is, however, nothing certain about this, for the ground may freeze again during the winter. The average temperature for the year is considerably below freezing. Gravel stripped, drained and thawed to a depth of more than 15 ft. has been known to freeze solidly during the next cold season. There is much ground that now has all the characteristics of stripped and drained creek beds, yet this ground thaws superficially in summer and freezes again in winter. It is to be hoped that stripping and draining will result in progressive thawing to bedrock in the Klondike creek beds, for if successful the practice could be applied elsewhere, thus extending the dredging province considerably.

Stripping by thawing alone did not prove successful in Klondike, for it was found that material did not thaw to any considerable depth below water level. During 1908 the gravel was drained and much better results were accomplished. As predicted in this JOURNAL (Jan. 4, 1908, p. 58 and Mar. 7, 1908, p. 512) it was found that gravel does not thaw below water level when it is of the depth generally encountered in the Klondike creeks. When there is a considerable depth of overburden, which may be stripped by hydraulicking, and a relatively shallow section of gravel is left for dredging, this stripping, aided by draining will usually result in seasonal thawing to bedrock.

Dredging in its limited meaning is applied only to unfrozen areas. Where frozen ground is encountered other methods incorporating some of the features of drift, hydraulic, or other open-cut mining practice is applied. There was considerable progress in dredging in the Klondike, and the high gold content of some of the gravels will result in exploitation even though the working cost may be high.

Dredging in unfrozen ground has been carried on with great success. The fact that where most of the dredging was prosecuted the ground was only partially frozen, was a great advantage.

Recent installations of dredges include buckets of 7 cu.ft. capacity. Several dredges with 5-cu.ft. buckets were installed two years ago. A 7-cu.ft. dredge installed in 1905 was successful from the beginning. The larger bucket seems to have shown its advantages in Klondike as elsewhere. This experience is similar to that of dredge men in California where there was for a time a retrogression toward small buckets for working ground suitable for large dredges.

ELECTRIC ELEVATORS

The electric elevators used in Klondike in 1908 may be classed with dredges. The machines were installed in the creek beds where it was thought that dredging could not be prosecuted advantageously. The elevators consist of a chain of buckets mounted on a ladder, the buckets being heavier than the stacker buckets of a dredge because they must stand the strain of excavating material from a sump. The material is conducted to the sump by driving with a stream from a hydraulic nozzle. Two centrifugal pumps are used to raise the excess of water that the buckets do not lift.

The method which is one form of open-cut mining employing sluices for saving the gold, allows the sun and air to do most of the thawing; it also exposes the bedrock and allows it to be thoroughly cleaned by hand. The elevators are not mobile, and since they must be moved occasionally they involve a loss of time.

A machine of this type used in Australia has some advantages in the matter of mobility. Material is hydraulicked into cuts that conduct it to a sump; it is not driven to the sump as in Klondike. It is raised by a centrifugal pump to the sluice, the pump being placed on a barge. When it is advantageous to move, the pit is flooded, the barge floated to a new position, the water pumped out, the barge settling on bedrock and the work is resumed. This arrangement gives fair mobility.

There are no data for comparison of the two methods. For the Australian plant, a working cost of 4.6 to 5.6c. per cu.yd. is given when gravity water is available and 6 to 9c. per cu.yd. when water must be pumped by steam power to the hydraulic nozzle.

It is interesting to note that the operation of the elevators in the Klondike is similar in all essential features to one carried on in 1903 on El Dorado creek, also in the Klondike. Material was hydraulicked with but small pressure to a bucket elevator operated by steam. A centrifugal pump run by steam handled the excess of water. This plant operated on a small scale with but little water under low head and the fuel cost was heavy. Its operation was discontinued and other methods were applied.

The new operations with elevators will have plenty of water under high head, which will permit working a large pit thus exposing large areas to the thawing action of sun and air. The use of electric power on the elevator and pump will also effect a great saving as compared with steam power. This enterprise is a good instance of what may be accomplished by a powerful corporation working on a large scale.

The open-cut method most commonly used by the one-man proposition of recent years in the Klondike and the so-called elevator method recently installed possess several similar features. By the old methods stripping was effected by ground sluicing, by means of horse or steam scrapers or in some other way. The bedrock gravel was shoveled into cars or skips or other receptacles and elevated to the sluices. As now worked the stripping and transportation of gravel to the elevator is effected by hydraulicking and the elevator lifts it to the sluice. Had a supply of water been available elevators would have been used very generally in the early days.

SEWARD PENINSULA

On Seward peninsula, in Alaska, dredging was successful wherever proper methods have been employed. Where failures have occurred, management such as would have resulted in failure elsewhere was responsible. There are, to be sure, a number of difficult problems connected with the hostile conditions of the far north. Frozen ground is a drawback more than a "bugaboo." There are areas of unfrozen ground in Alaska and some of these will be dredged at good profit. Whether the large volumes of tundra gravel will ever be exploited successfully by the dredging method is problematic, but it is likely that if frozen ground can be thawed out successfully in Klondike by stripping and draining the tundra gravel may be treated similarly. However, the problem of preventing gravel thawed in summer from freezing solidly during the following winter is yet to be solved.

OTHER COUNTRIES

Investigations are being carried on in Siberia and new dredging ground is being developed. Where there has been such a large output of gold, most of it by placer methods, it is likely that there will be a considerable development of dredging ground.

Dredging in West Africa experienced the difficulties encountered elsewhere in the tropics. The bad sanitary conditions had a considerable effect upon costs. In one instance much time was lost by reason of continued high water. Buried timber was also an obstacle.

In Australia, dredging was carried on as formerly. The water-power dredge, which is operated by impact water wheels the water being conducted upon the dredge through an articulated pipe, worked satisfactorily. Dredges have failed on areas in Australia because of their inability to excavate difficult material or bedrock. It is probable that if large, powerful dredges of the California type were installed on some of these areas success would be attained. Some of the California dredges are now operating in ground so hard that it cannot possibly be

dredged at a profit by small, weak dredges, such as are generally used in Australia. It is well to compare the cost of a large California dredge, about $150,000, with that of the type used in Australasia, about $35,000.

In the Philippines the industry had its vicissitudes, but it is hoped that changes and improvements in the dredges will result in better working. Difficulties due to tropical environment are experienced in the Philippines as elsewhere in the torrid zone.

Another dredge was installed in Dutch Guiana and it is said that although it operated in rich material, mechanical difficulties have caused much trouble. This dredge was manufactured in Europe and is lighter and much less powerful than the California type.

Two dredges were installed in Brazil, where it is expected that both gold and diamonds will be extracted. Neither of these dredges has as far as I know worked profitably as yet.

In Tierra del Fuego, dredging seems to have been successful in but few operations. In several cases, machines of poor design and material were installed. No dredges of the California type have yet been built in Tierra del Fuego. In one instance, peat excavated from the overburden ahead of the dredge is said to have been used as fuel. English coal at more than $15 per ton has been generally used. The dredging season is about 10 months in duration.

Design and Construction

There were no radical changes in dredge design and construction during 1908. There were improvements in the nature of refinements in details of design and manipulation. The close-connected bucket was again found to work more satisfactorily than the open-connected type. In several cases in which 3-cu.ft. close-connected buckets were substituted for 5-cu. ft. open-connected buckets, considerable gains in capacity and saving in power were noted. This was particularly noticeable where indurated material was dredged on a headline anchorage. Considerably less wear, tear and breakage was also noted, for there was much less surging with the close-connected bucket. Heavier construction is more common and the limit does not seem to have been reached in this respect.

No gold dredges with steel hulls have yet been built in the United States. Wooden hulls have not been satisfactory, the life of the wooden hull in California being only about 10 years. Wooden hulls also become much distorted in a few years. To prevent distortion more structural steel has been used and longitudinal and lateral trusses are now incorporated. Time alone can determine whether these trusses will prove effective. Steel hulls would probably be more rigid and more durable than those of wood, and would also be more costly. There seems to be no immediate prospect of a dredge with a steel hull being built in the United States.

Steel hulls should be more generally used in tropical climates where wood-boring insects and decay make the life of a wooden hull a short one. Easier transportation of the steel plates than lumber is also an important consideration where inaccessible regions are concerned.

The respective advantages of quicksilver riffles and cocoa matting were better determined during the year than ever before. It is now generally accepted that under normal conditions, where there is a clean dredge pond and clean gold, little difference in the respective percentages of saving will be noted. When the dredge pond is dirty, as generally occurs with dredging not conducted in a river, the quicksilver riffle is superior. Where there is gold that will not amalgamate, cocoa matting is the better. Considerations of convenience in cleaning up the gold-saving areas often govern the choice.

Costs

Dredging costs in the United States did not vary materially from those of former years. Operations on a larger scale in Klondike have lowered expenses, but no work has yet been done in tropical South America with a first-class modern dredge so that no figures are available for comparison. It has been variously estimated, by competent authorities, that for an operation involving the dredging of about 1,000,000 cu.yd. per year, where transportation is not difficult, a working cost of 10 to 25c. per cu.yd. may be anticipated. To one familiar only with dredging in California and having no knowledge of the disadvantages of tropical environment, these figures will seem excessive; but until dredging is conducted on a considerable scale in the torrid zone, it will be advisable to allow a working cost of not less than 10c. per cu.yd. as the minimum figure.

Small Dredges

The need of a small dredge for the exploitation of areas not suitable for a large dredge is recognized in some quarters. The tendency since the introduction of dredges in California has been to build larger dredges with larger buckets. To be sure there was a time after the installation of the first 5-cu.ft. close-connected bucket when several 3-cu.ft. close-connected bucket dredges were installed. This was because of constant difficulty with the first 5-cu.ft. close-connected bucket resulting from bad design and weak construction. Recent practice has approved the use of larger buckets.

The small bucket has come into disfavor largely because it was used as at Oroville in ground that was essentially suitable to working with large buckets. There is a distinct demand for a small dredge suitable to work inconsiderable areas or on areas of such shape and irregularity as to make it difficult to manipulate a large machine. There is also the consideration of cost which is a vital one. A dredge with 5-cu.ft. buckets costs about $100,000; a dredge with 2½-cu.ft. buckets should cost about $30,000. The capacities of these dredges should be about as three to one.

The record of failures has given the small bucket a bad name that it does not merit. There are areas in the tropics where the small dredge can be used to good advantage. Its light weight makes transportation, installation and operation easy and cheap; high gold content will compensate for the small capacity. By its means shallow ground of inconsiderable total acreage can probably be made the basis of a company when the first cost alone of a large dredge would make final profit an impossibility.

The small dredge has a function as a means of prospecting ground preliminary to the installation of large dredges. Small dredges have been used in this way in but few instances. Stewart river, in Canada, was prospected by this means in 1903. The common way of prospecting is to use steam or hand drills and results can thus be attained that are reliable and detailed. Drilling is cheap by comparison and a large acreage can be drilled so as to get detailed information at a much lower figure than the first cost of the prospecting dredge. The sectionalized gold dredge for muleback transportation is yet to be designed. The small dredge naturally will be more easily arranged for such transportation than larger and heavier dredges.

Gold dredging has been conducted with an unusual confidence in the honesty of the men who work on the dredges. On only a few dredges are there devices to prevent theft of gold from the gold-saving areas. During 1908 it was found that considerable amounts of gold were being stolen from dredges in California. This incident will probably lead to the incorporation of devices to keep under lock that part of the gold-saving areas where most of the gold is caught. This can be done easily and it will be good practice on all dredges. Even if not necessary, such procedure will be no more than a good business precaution.

Another large merger of dredging companies was recently consummated in California. A total acreage equal to all of the dredging ground at Oroville was

included. It is expected that lower working cost will be attained than when operating under several corporations. Standardization of dredge machinery in size and design will be attempted and the merged interests will build their own dredges. Dredging is one kind of mining that is particularly amenable to merger.

The Rare Metals VII—Tungsten

By Charles Baskerville*

Tungsten is commonly associated with granite. It is not found free in nature, and its ores are not numerous. The tungsteniferous minerals are shown in the following table:

TUNGSTEN MINERALS.

	Tungstic Acid Content.
Scheelite, calcium tungstate	71–80%
(a) Cuproscheelite, see cuprotungstite	76–80%
Wolframite, iron and manganese tungstate	74–78%
Hübnerite, manganese tungstate	73–77%
Stolzite, lead tungstate	51%
Ferberite, ferrous tungstate	70%
Powellite, calcium molybdate	10–11%
Reinite, iron tungstate	75%
Raspite, lead tungstate	49%
Tungstite, tungsten trioxide	100%
(a) Wolframine, tungsten trioxide	100%
(b) Meymacite, hydrated tungstic oxide	71–75%
(c) Cuprotungstite, copper tungstate	56%

Copper and calcium tungstate is also called cuprotungstite.

Tungsten and tungstates are prepared from scheelite, wolframite and hübnerite. Tungsten is used quite extensively in the manufacture of steel for special purposes. Alloyed with steel, either by itself or with molybdenum and chromium, a product is obtained which possesses great toughness and ability to resist shock. This grade of steel is employed for high-speed tools, armor plate, projectiles, car springs, etc. Special alloys with aluminum, copper and various other metals have been prepared. An alloy of copper and aluminum containing tungsten possesses great strength and toughness. Tungsten is now utilized in manufacturing filaments for electric lamps; such lamps give good light, have low power factors and are less expensive to manufacture than the Cooper-Hewitt and Nernst lamps. Sodium tungstate is used as a mordant in dyeing, for rendering materials non-inflammable, as a decolorizing agent for acetates, and as a decorticator in preparing raw fibers for manufacturing. Sodium and potassium tungstates are employed in the production of "Magenta bronze" and "Saffron bronze," respectively; a mixture of these bronzes yields a violet pigment. Tungsten trioxide is used as an oil and water color, and in the manufacture of a yellow and blue pigment.

The demand and prices for tungsten are strong.

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Scheelite

This mineral is usually associated with crystalline rocks, and is found with cassiterite, topaz, fluorite, apatite, molybdenite, or wolframite, in quartz, and associated with gold. Molybdenum is often present and may replace a considerable amount of the tungsten. Didymium, cerium, lanthanum, and tantalum may also be present. It is found in this country in Connecticut, Massachusetts, North Carolina, Nevada, Idaho, Colorado, Montana and California.

Scheelite occurs in heavy brownish white or white masses, square pyramids, and in crusts of yellowish or brown crystals. It is a brittle mineral, having a vitreous luster inclining to adamantine, and may be found in a variety of colors—white, pale yellow, yellowish white, brown, green, or red; it is sometimes almost orange yellow. The streak is white; the hardness is 4.5-5.0, and the specific gravity is 5.9-6.1.

Scheelite fuses before the blowpipe with difficulty; the edges of the mineral fuse under prolonged treatment to a semi-transparent glass, not coloring the flame. It is soluble in borax in the oxidizing flame, forming a clear glass, which soon becomes milk white and crystalline. With salt of phosphorus, it dissolves easily in the oxidizing flame to a clear bead which becomes deep blue in the reducing flame from the formation of tungsten dioxide. Varieties containing iron give a brownish glass in the reducing flame, so they require to be treated on charcoal with tin before the blue color appears. The blue salt of phosphorus bead dissolves in dilute hydrochloric acid to form a deep blue solution, especially if metallic tin is added. When scheelite is pulverized and digested in a test tube with hydrochloric acid, the tungstic acid separates as a yellow powder; upon adding a piece of tin, the whole solution is colored blue. Scheelite is also decomposed in nitric acid.

Scheelite is distinguished from other non-metallic minerals by its weight and behavior before the blow pipe, especially in salt of phosphorus.

Cuproscheelite fuses before the blowpipe to a black glass, coloring the flame an intense green. With the fluxes, it gives characteristic tungsten reactions, and dissolves in hydrochloric acid with the separation of tungsten trioxide.

Wolframite

Wolframite is a frequent companion of tin ores, the cassiterite and the tungsten minerals having developed in much the same way. In some tin mines wolframite is an annoying impurity. It is also often associated with quartz, native bismuth, scheelite, pyrite, galena and sphalerite. This mineral is found in this country in Connecticut, Maine, North Carolina, Missouri and Nevada. Wolframite occurs in heavy dark-gray to black sub-metallic crystals, orthorhombic, and also in coarse divergent columnar and granular masses. It is a brittle mineral with an uneven fracture and sub-metallic luster, and is generally of a dark brown to black in color. The streak is greenish gray to black; the hardness is 5-5.5; and the specific gravity is 7.2-7.55. Sometimes wolframite is feebly magnetic. It sometimes occurs altered to scheelite.

Wolframite fuses easily before the blowpipe to a globule, which has a crystalline surface and is magnetic. With salt of phosphorus it gives a reddish yellow glass while hot, which is paler on cooling; in the reducing flame, this glass becomes dark red and opaque. If this bead is pulverized and dissolved in dilute hydrochloric acid with the addition of tin, a blue solution is produced. With borax, a clear glass is produced in the oxidizing flame, and the iron or manganese reaction predominates. Wolframite fuses to a bluish-green manganate with soda and niter. It is decomposed by aqua regia with the separation of tungstic acid as a yellow powder, and is partially soluble in hydrochloric acid. The latter solution becomes intensely blue upon the addition of metallic zinc or tin. Wolframite is distinguished from titanic iron by its fusibility and deportment with salt of phosphorus.

Hubnerite

This mineral is abundant at Osceola, Nevada, with some scheelite, in veins of white quartz in a porphyritic granite. The tungsten deposits of the Dragoon mountains, Arizona, are of similar character. It is also found in Colorado, Montana and New Mexico.

Hübnerite is found usually in bladed forms, rarely in distinct crystals. The color is brownish red to hair brown to nearly black, and the streak is greenish gray to yellowish brown. It is less fusible than wolframite and with the fluxes gives manganese and tungstic acid reactions.

Mining and milling costs per ton of ore crushed at the Simmer & Jack East property, South Africa, for the fiscal year ending in 1908 were: Mining, 10s. 6.224d.; pumping, 4.067d.; sorting and crushing, 4.487d.; transport of ore, 6.161; milling, 1s. 8.195d.; cyaniding, 1s. 0.756d.; slime expense, 4.977d.; general charges, 1s. 4.496d.; total, 16s. 3.365d.; redemption of development, 3s.; grand total, 19s. 3.365d. per ton of ore crushed. During the year 200 stamps ran 334.27 days and crushed 400,760 tons, or 5.995 tons per stamp per day. The ore milled assayed 5.942 dwt. per ton. The total saving was 92.09 per cent., 56.82 per cent., being saved by amalgamation. The tonnage mined was 464,395; of this 13.696 per cent. was sorted out as waste rock.

Slag Car Used at the Cananea Smelting Works

The Cast-steel Bowl Has a Capacity of 45 Tons and Is Held Rigidly Upright by Means of Steel Spring Latches upon Its Truck

BY CHARLES F. SHELBY*

The Cananea Consolidated Copper Company has developed a new slag car especially adapted for use in smelting plants where the tonnage to be handled is large and the available head room is limited. The car, which is shown in the accompanying illustrations, has a capacity of 45 cu.ft.; one train crew with six of these pots easily handles 1000 tons of slag per day. There are larger slag cars in use, but in designing the pot here illustrated, all the best features of the many different cars employed for handling large quantities of slag seem to have been combined.

NEW SLAG CAR, CANANEA CONSOLIDATED COPPER COMPANY

The bowl is of Midvale cast steel and the trunnions are so placed that the pot is "bottom heavy" when empty and "top heavy" when full. The pot is held rigidly in an upright position on the carrying truck by means of two spring latches, consisting of flat bars of spring steel ⅜ in. thick attached at one end to the trunnion face and the free ends engaging catches on the frame of the carrying truck. There are two of these latches, one at each end of the pot, and the respective catches are on opposite sides of the truck frame. A special tool is used to dump the bowl; it is called the spring-release lever, and is formed so as to grasp the loose end of the spring latch; a long handle of 1½-in. pipe enables the operator to spring the latch at one end of the truck free from its catch and to start the bowl from its center of equilibrium. The pot then rolls over on its rocker runners and dumps its contents automatically.

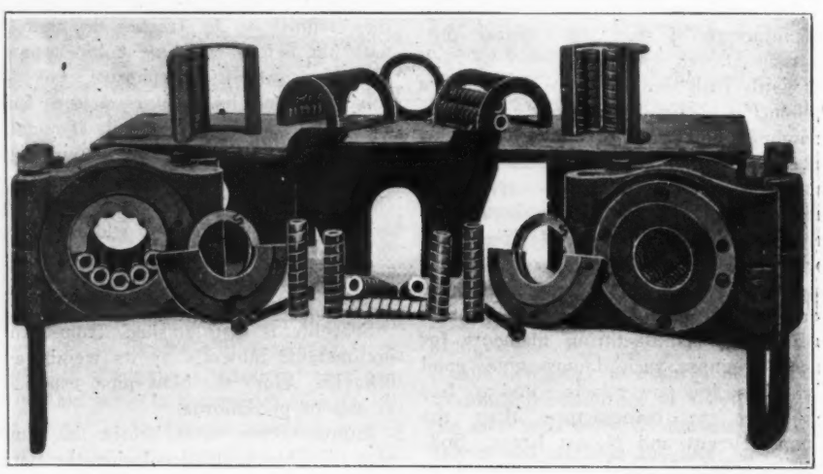
*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Sonora, Mexico.

Over all the length of the slag car is 13 ft. 7 in., the wheel base being 8 ft. The bowl casting is 9 ft. 10 in. long; 5 ft. 2 in. wide and 39½ in. high. The thickness of the steel at the bottom of the bowl is 3 in. and at the sides 2½ in. The trunnion shafts are of wrought steel 3¾ in. diameter and are attached to the body of the bowl by means of 2-in. keys.

Both the body frame of the truck and the frames upon which the bowl rocks, are constructed of 75-lb. rails. The rocker frames do not rest directly upon the main frame, but are elevated above it upon 7-in. cast-iron chairs. The pot does not swing in trunnion bearings, but rocks upon cast-iron rockers, or segments of wheels, provided with tread and flanges.

The body of the truck is a bent-rail frame with rounded ends, braced at the center with a ⅜-in. plate and near the ends by the rail frames upon which the bowl rocks. Upon this body are mounted the draw-heads and the bearings for the wheels. The truck is suspended below the axles of the 24-in. wheels by means of U-bolts, which secure the bearing boxes to the frame. The wheels are of manganese steel, which seems to stand up exceptionally well under the severe conditions of the work. The truck is built for a 2-ft. 11-in. gage track.

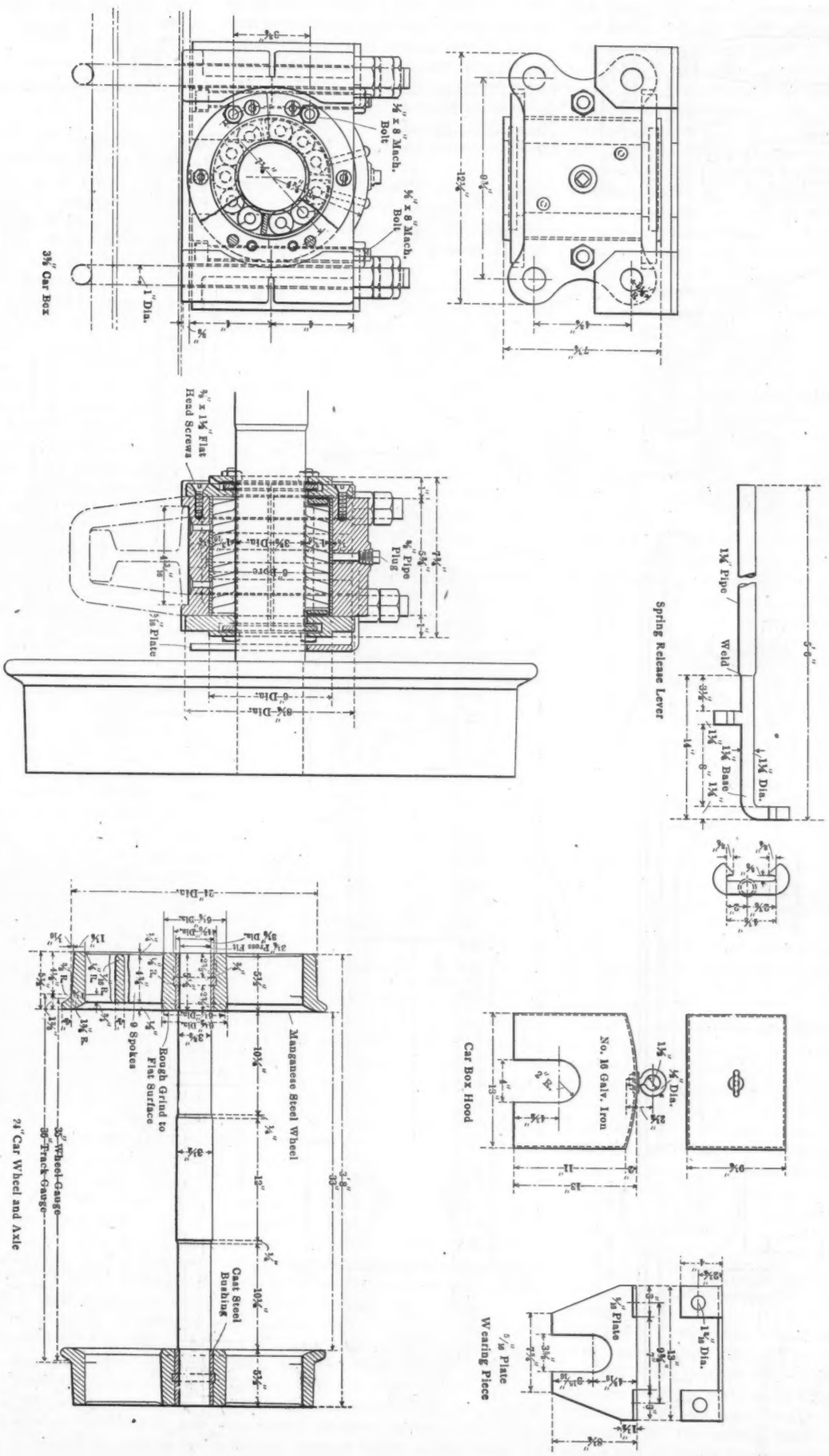
The Hyatt roller bearings, shown in detail in the accompanying illustrations have, with the design employed, practically eliminated all trouble due to failure of truck bearings. The rollers are helical coils of tempered steel, having sufficient spring to eliminate much of the unnecessary friction due to strains. The strenuous duty required of the bearings of these large slag cars is particularly severe because of the heat to which all parts are subjected. The ordinary means of lubrication, the box bearing with oil cellar and waste, usually fails under these conditions. The Hyatt bearings used in this Cananea car eliminate practically all of these difficulties.



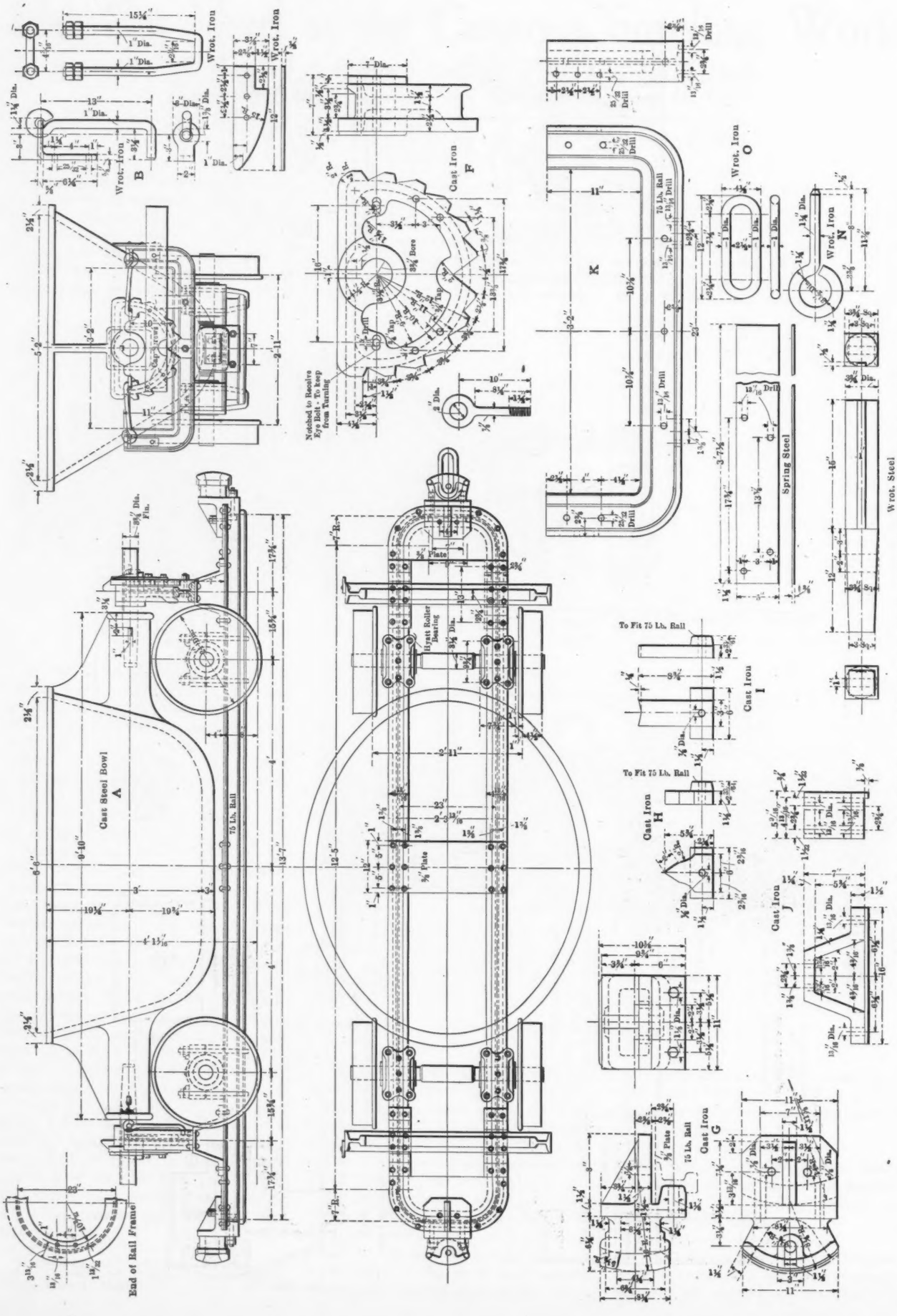
HYATT ROLLER BEARING, CANANEA SLAG CAR

As a general rule, air-courses should always have as large an area as possible; this reduces the rubbing surface per square foot of section.

The Broken Hill Proprietary Company is going to install a baghouse in connection with its smeltery at Port Pirie.



CANANEA SLAG CAR. DETAILS OF WHEELS, HYATT ROLLER BEARINGS AND SPRING RELEASE LEVER



SECTIONS, PLAN AND DETAILS OF SLAG CAR, CANANEA CONSOLIDATED COPPER COMPANY

The London Tin Market in 1908

SPECIAL CORRESPONDENCE

January started with an advance of 25s. per ton, bringing the price of three months' warrants up to £122. This was inspired by news of unexpectedly small shipments from the Straits, coupled with a reduction in the English bank rate of interest. Eastern and other sellers were alert to profit by the enhanced values, and bears followed their lead, whereby prices were temporarily depressed to £121 5s. for cash warrants, and £122 5s. for three months. On Jan. 9 considerable activity developed in consequence of improved American demand coinciding with the withdrawal of Eastern sellers. Further strength was indirectly imparted by the improved market for copper, until—on Jan. 15—£125 15s. was paid for cash warrants, and £126 10s. for three months, at which point the movement spent itself and the market lacked support. The relapse, however, was of short duration and was more than recovered when it became known that large American purchases had been made in the East, whereby bears were prompted to cover their recent sales. Later reports of heavy shipments from the East indicated unfavorable statistics, and the market was subject to some manipulation in view of the approaching Banka auction. Prices were thereby forced down to £122 10s. and £123 5s., respectively. This reduction, however, attracted some attention, particularly in America where stocks had run low. Moreover, the Banka sale produced the respectable average equivalent of £122 10s., whereupon sellers held back and prices moved up, closing at £124 5s. for cash, and £125 for three months.

In February the opening coincided with the Chinese new-year holiday, and afforded opportunity for operating on the bull side, whereby values were sharply raised, three months' warrants touching £131 on Feb. 5. Bears covered their commitments eagerly, and consumers bought freely, the turnover of the first week amounting to 3900 tons. Trade prospects, however, were not encouraging, and caution was inspired by the prospect of increased supplies. There was a speedy relapse which, on Feb. 18, caused cash warrants to change hands at £126. During that period the market was active, but irregular and confused, with occasional rallies due to the bull party controlling most of the supply and thereby forcing bears to cover their sales. Thereafter speculative interest subsided and business was restricted. Eastern holders refused to follow the downward trend, and as offers became scarcer the market improved, being further strengthened by the improved aspect of copper as well as by an increased demand from America. Cash warrants rose at one time to £132, but the demand for prompt supplies was soon satisfied, and the market lacked support beyond what was afforded by bears covering. There was, moreover, assured evidence of ample supply. The closing prices were £129 10s. for cash, and £129 for three months onward.

March was an eventful month, opening with a fall of 30s. to £129 10s. for cash warrants, and £127 10s. for three months; the fall being induced by unfavorable statistics. On March 4 it was announced that the Dutch Government had revoked its recent decision to augment the sales of Banka by 1500 tons during 1908, so that the year's supply would be approximately the same as last. This announcement completely altered the tone of the market, and bears rushed in to cover their commitments, thereby raising prices to £136 10s. and £132 10s., respectively. This, however, was too sudden to last, and demand for early delivery was freely met by bull speculators and by Eastern holders. The volume of business during the first week was about 4000 tons, and prices closed at £133 10s. and £130 5s., respectively. On the resumption of business a further advance was made, due partly to purchases of forward metal by Chinese operators, and the market was practically controlled by the bull party for the rest of the month. Cash warrants were scarce, but the diminished American demand obviated serious trouble, and consumers generally were careful to buy only from hand to mouth. Some little relapse occurred during the third week when Eastern dealers sold freely, thereby depressing the cash price from £140 to £137 15s.; but skilful manipulation followed, carrying prices up until—on March 25—£147 was paid for cash, and £144 10s. for three months' delivery. On that day the Banka auction disposed of 1870 tons at the average equivalent of £147. Again followed a reaction due to realization of profits and withdrawal of support, and the fourth week closed at £143 10s. and £142, respectively. Excitement was engendered by a successful raid on the bear party, resulting in an advance to £145 10s. and £144 10s., respectively, fluctuations being very sharp. Final quotations were £144 5s. for cash, and £143 for three months.

April opened under more normal conditions than had lately prevailed, the excitement having greatly subsided. Eastern operators were ready sellers, and European holders liquidated hurriedly, thereby lowering the three months' price at the outset to £139 10s. At this juncture American and other buyers came in with good orders for consumption, and statistics of supply were regarded as favorable. Prices advanced in two days to £145 5s. cash, and £143 15s. three months, followed by a further advance of 15s. on April 6. This rapid advance brought out sellers who met demand freely, a sharp bear attack being followed by pronounced weakness which brought down values to £141 10s. and £140 10s. on April 7. Another two days brought about a recovery to £145 and £143 5s., respectively, due to the support of leading interests. This again was followed on April 13 by a relapse of £2 15s., which in turn gave place to a sharp recovery on the news of a strike at the smelting works at Singapore. On the whole the market was erratic and subject to incessant manipulation in Europe and America. High-water mark was reached on April 23, when values stood £145 and £143 15s., respectively. Further fluctuations followed, business being mostly speculative; and closing prices were £143 for cash warrants and £142 for three months.

May opened with cash warrants at £142 5s., and three months at £141 10s. Shipments from the East were small, and statistics showed a decrease of 2493 tons in all; but the market was unresponsive, and prices dropped under pressure of realizations until—on May 13—the figures stood at £133 and £132, respectively. At this point short sales were briskly covered and some speculative purchases ensued. May and June supplies were found to be under strong control, and prices advanced in consequence to £137 15s. on May 19. On the following day prices broke sharply under forced realizations and general selling pressure until—on May 28—cash warrants changed hands at £126 5s., and three months at £125 10s.; the bull party being powerless to arrest the decline in face of enormous shipments from the Straits—estimated at 6800 tons for the month. The Banka sale in Amsterdam on May 26 realized the average equivalent of £133 10s. Throughout the month the consumptive demand was unimportant as compared with the speculative turnover. Only at the close of the month was some improvement effected, when a sharp rally carried values to £129 5s. and £128 5s., respectively.

June revealed an increase of 2731 tons in the stocks during the previous month, and prospect of heavy shipments from the Straits. The market opened weak, with heavy liquidations by tired holders. The cash and three months prices touched £126 15s. and £125 10s., respectively, but improved in sympathy with other markets and with some renewal of speculation. It was not until June 11 that any decided improvement was manifest, when Eastern offerings were reduced and three months' warrants were commanding a premium. On that day the cash and three months' prices closed at £129 2s. 6d. and £129 17s. 6d., respectively. Business, however, was almost entirely professional and lacked the support of genuine trade. American demand was conspicuously lacking, manufacturers being amply supplied. The rest of the month saw declining values and restricted business, the market

being sensitive to the frequent realizations by importers. There were feeble rallies as offers subsided and operators tried to support the market, but the close was featureless and dull; cash warrants being quoted £125, with £126 2s. 6d. for three months.

July looked unpromising at the outset, consumptive demand being restricted and Eastern holders selling freely. Statistics, however, revealed a decrease of 1288 tons, whereupon bears took advantage of reduced prices to cover their commitments, and the market improved to £125 and £126 5s. At the advanced prices importers and Eastern sellers were for a time quite ready to meet the demand, but the market displayed considerable power of absorption, even at a rise of £2 on July 8. Thereupon bears became alarmed and hastened to cover, while demand set in from all sides. On the following day an advance of no less than £5 per ton was registered, and the advance culminated on July 10 when £133 15s. was paid for three months. Again a temporary reaction foldominated for some days, it being manifest that the movement was purely speculative and unwarranted by the conditions of the trade. Prices gradually fell back to £129 and £130 respectively, when speculators resumed buying and absorbed all offerings at advancing prices until, on July 16, a price of £135 was paid for three months'. Again a temporary reaction followed, induced by realization of recent purchases from the East; but by this time the notable advance in the share market had set much speculation in motion, and brokers were able to induce clients to take an active interest in metals. Strong buying ensued, in which consumers participated, whereby three months' warrants were raised to £140 on July 23. A healthy reaction followed, induced by Eastern and other sellers, as well as by the approaching Banka auction. When it became known that the latter had resulted in sale of 1800 tons as high at £142 speculation revived, and three months' warrants rose from £137 10s. to £139 15s. Statistics at the end of the month showed an increase of about 1600 tons. The consumptive industries appeared well employed, though the American tinplate trade left something to be desired. Speculative purchases sufficed to counteract the liberal offers of holders and of bears, and the month closed with cash warrants at £138 10s., with £139 15s. for three months'.

August opened, after the statutory holiday, and in the absence of several prominent operators, with a decline to £136 10s. cash, and £138 for three months, due to bear pressure which, however, failed to dislodge any important quantity. The lower level rather attracted speculative purchasers, resulting in improved values and followed by moderate consumptive buying. Eastern holders showed enough reserve to harden the market until £140 was paid for distant delivery. This figure prompted realizations which, however, were well absorbed; while the continued firmness of Eastern sellers kept prices fairly steady until Aug. 12, when it became known that shipments from the Straits during the first 10 days of August amounted to the large total of 3000 tons. Thereupon selling pressure ensued which, for a while, was counteracted by the uplifting of fairly large quantities falling due; whereby the value of cash warrants was relatively enhanced and the contango reduced to 5s. Amid numerous fluctuations weakness predominated, and the second week closed at £135 12s. 6d. and £136 respectively. The third week opened with a break of nearly £4, caused mainly by continued heavy shipments from the East, both of current production and accumulated stock. There was an active business at the reduced prices, and some recovery in values; but bearish sentiment prevailed, and the improvement was partly lost. The fourth week opened still lower, due to fears inspired of further increase in the Eastern supply; and the lowest was touched on Aug. 25 when heavy realizations and bear selling combined to bring cash warrants down to 130 15s. and three months to £131 10s. Shipments, however, were found to be less than had been expected, and a recovery of almost £3 ensued but was not fully maintained. The close was dull in the absence of consumptive demand, with cash warrants at £132 7s. 6d., and three months £133 2s. 6d.

September found the market weak at the outset for lack of leading bull support, whereby the recent improvement was wiped out. At £131 15s. buyers of three months' warrants came forward, encouraged by the absence of offers from the East, and speculative interest broadened until £133 10s. was reached; from which point values receded to £132 10s. in sympathy with other markets. The second week opened strongly on the continued reserve of Eastern holders, and three months' warrants advanced to £133. American consumers gave the market no support and speculation subsided at this point, whereby holders were tempted to realize, more especially as Eastern offers became more frequent. Fluctuations were mostly downward until Sept. 21, when cash warrants stood at £130, and three months' at £131 7s. 6d.; from which point a sharp rally ensued, prompted by renewal of American demand. At the Rotterdam auction on Sept. 24 about 1800 tons Banka were sold at the average equivalent of £133 2s. 6d. Statistics at the end of the month disclosed large supplies, but these were disregarded in face of large demand, both speculative and consumptive. Closing values were £134 for cash warrants, and £135 10s. for three months.

October opened with a weak market, influenced by increased supplies and the prospect of an increased quantity of Banka to be auctioned in the next year. Fluctuations were numerous and induced by improved American demand, alternating with heavy realizations of speculative holdings. The lowest was touched on Oct. 13, when three months' warrants changed hands at £133 10s. Eastern sellers were not pressing, and American consumers bought but sparingly; but prominent operators judged the movement favorable for an improvement in sympathy with other commodities, and offerings were plentifully absorbed. Thereafter, with numerous fluctuations, the tendency was upward; and the month closed with cash warrants at £136 5s., and three months £137 15s. per ton.

November statistics were more favorable than had been anticipated, and prompted a concerted bull movement which gathered strength after the result of the American presidential election was known. Opening at £137 10s. for cash, and £139 for three months, prices were carried—with occasional relapses due to speculative realizations—up to £142 5s. and £144, respectively, after which the buying power was insufficient to arrest the decline caused by persistent realization of old holdings; and values drifted down to £135 5s. and £137 5s. on Nov. 16. America sent substantial buying orders at each decline, pointing thereby to an improved statistical position ultimately in spite of heavy shipments advised from the East. Values again improved to £137 and £139, respectively on Nov. 19, relapsed again to the extent of 30s.—at which decline large quantities were marketed—and recovered to £137 7s. 6d. and £139 7s. 6d. on Nov. 25. Thereafter depression ensued on unfavorable statistics and heavy shipments from the Straits. At the Banka auction in Amsterdam on Nov. 26 a total of 1870 tons was sold at the average equivalent of about £140. The month closed with a dull market at £135 2s. 6d. cash, and £136 15s. three months.

In December persistent selling, chiefly by Eastern holders, caused weakness from the outset. The consequent decline in values was temporarily arrested, but proceeded farther as a result of bear selling. Reduced prices attracted buyers, and large quantities were absorbed, sometimes causing a temporary rally; but at each improvement in values sellers competed keenly and renewed the depression until —on Dec. 14—£130 10s. was accepted for cash warrants, and £132 5s. for three months. At this point the market was steadied by a fair consumptive demand—more from America than from Europe—and rallied somewhat; but heavy shipments from the East, coupled with readiness of Eastern holders to sell, checked further improvement, and values remained for several days round about £132 and £133 10s., respectively; closing weak at £131 7s. 6d. for cash and £133 for forward tin.

The London Spelter Market in 1908

SPECIAL CORRESPONDENCE

January opened with some activity due to improved Indian demand for yellow metal, and in a lesser degree to active buying for galvanizing. Competition, however, was too keen to allow of any improvement in price until Jan. 13, when it became known that the leading European producers were convening a meeting to discuss a policy of curtailment in production. Speculators were alert to forestall the improvement thus foreshadowed, and a large business developed in spelter and also in sheet zinc. Some revival of demand for galvanized iron also stimulated the upward movement which culminated on Jan. 20 with £21 7s. 6d. paid for ordinary brands. Thereafter values fell away under pressure of realizations by speculators, producers remaining firm, however, and holding little unsold, while the continental inland transport was impeded by ice and so tended to reduce available supplies. Closing prices were £20 12s. 6d. per ton for ordinary brands, and £21 7s. 6d. for Silesian specials.

In February uncertainty prevailed at the opening concerning the projected convention of the German producers, and some little weakening of prices resulted; but offerings were small and demand fair, so that the relapse was insignificant and transient. It soon became known that the convention was definitely established, and the market firmed up in consequence to £21 17s. 6d. for ordinary brands. Consumers and dealers alike bought freely, some improvement in the galvanizing trade serving as an additional stimulus, as also a large business in sheet zinc. The advanced price induced some realizations about the middle of the month; and demand being now satisfied, prices were allowed to drift downward while consumers held off awaiting the result of negotiations for extending the convention so as to include Belgian and other continental producers. The decline was gradual during the remainder of the month, closing prices being £21 2s. 6d. for ordinary brands, and £22 7s. 6d. for specials.

March was singularly devoid of interest, and fluctuations were unimportant. Producers for the most part had sold well and were holding aloof. On the other hand consumers were slow to purchase, and their few orders were keenly competed for by dealers. Opening at £21 for ordinary brands, it at once relapsed 2s. 6d. per ton, and thereat remained for eight days. Demand then revived and caused a recovery of 5s., which ruled up to March 19, when a slight relapse was induced by pressure of second-hand parcels. At the end of the month large transactions with continental producers imparted renewed strength to the market, which closed with ordinary brands at £21 2s. 6d., with £21 17s. 6d. for specials.

April opened with an active market, stimulated by many consumers' inquiries. Ordinary brands, quoted at £21 2s. 6d.@ £21 5s., advanced 7s. 6d. per ton until April 8, after which inquiry dwindled chiefly as a result of the disappointing quietness prevailing at the quarterly meeting of the Iron Trades in Birmingham. On the Continent a large business was done extending into September, and foreign producers were consequently firm in their quotations, but numerous speculative parcels were placed on the London market at constantly receding prices, consumers remaining very apathetic. The rest of the month saw a slow but persistent decline in prices, which closed with ordinary brands from £20 17s. 6d.@£21 2s. 6d., and Silesian specials from £21 10s. to £20 15s.

May opened with a fall of 5s. per ton, due to dwindling demand and the keen competition for the few orders which consumers had to place. For a week or so the market was steady in view of producers' firmness and the inability of dealers to cover their speculative sales without loss. The next feature was a sudden drop to £19 17s. 6d. which was accepted for a speculative parcel thrust upon an unsupported market. Sellers continued to offer at a fraction over this figure for some 10 days, but the slackness of trade was too general and persistent to avert a further fall to £19 12s. 6d. The close was a trifle firmer, with ordinary brands from £19 15s. to £20, and Silesian specials from £20 to £20 5s.

June found the market destitute of support, consumers being apathetic, and dealers keen in competing for the few orders obtainable. The prolonged stagnation caused continental producers to become impatient, and their quotations eased off in consequence. The protracted and unfruitful negotiations in regard to the projected Producers' convention also tended to depress the market. Price of ordinary brands opened at 19 15s. and fell gradually but persistently during the month to £18 7s. 6d., closing thereat, Silesian specials being offered from £19 5s. to £19 10s. per ton.

July found a stagnant market at the outset, values being depressed by forced sales of arriving parcels. These were in most cases marketed at £18. Early in the month, however, considerable speculation developed in metals generally, wherein spelter participated to a moderate extent. The movement originated on the Continent, where operators turned to London as the cheapest market to buy in. The consequent improvement in values was more manifest as regards forward delivery than for prompt. Consumers followed the lead thus given, and additional firmness was imparted by increasing business in sheet zinc at advancing prices. The highest price recorded was £20 paid on July 20 for December delivery; but at the same time prices were very erratic for early delivery, and the trade requirements were not sufficient to impart steadiness. The market thereafter was neglected, and prices fell away toward the close, when ordinary brands were quoted £19, and specials £19 7s. 6d.

August opened quietly, the consuming industries being slack and not disposed to support the market. Early in the month, however, good business was reported from Germany, and improved reports from America helped to raise values. Speculative orders from abroad strengthened the upward movement, and consumptive demand followed. The close was firm at £19 5s. for ordinary brands, and £19 15s. for specials, with indication of recovery.

In September, business, though restricted, was fairly steady throughout the month, and fluctuations in price were unimportant. The gradual improvement in iron and steel was reflected in improved demand for galvanized wares, while sheet zinc was in increased request and helped to maintain prices of spelter. Producers, having sold well, were at no time pressing in their offers, and consumers were encouraged to cover requirements in view of the approach of winter. Ordinary brands opened at about £19 7s. 6d., advanced gradually and touched £19 17s. 6d. once or twice, and closed at £19 15s., with from £20 5s. to £20 10s. for specials.

October saw a steady trade throughout; consumers found the ruling prices reasonable and the prospects of trade more encouraging, and a fair volume of business resulted. Buyers were keen to obtain early delivery of what they bought, which is always an indication of improving trade, and this proved to be the case as the month advanced. Producers were firm in their quotations, and orders were taken mostly by dealers whose concessions caused a trifling relapse in prices down to Oct. 21, when £19 12s. 6d. was accepted for ordinary brands. Thereafter the market strengthened with expanding business, and closed at £19 17s. 6d.@£20 for ordinary brands, and £20 5s.@£20 10s. for specials.

November found the London market active on trade demand coupled with renewed speculative interest in the article. Opening at £20 for ordinary brands, the price steadily advanced, and the month closed with ordinaries at £21 7s. 6d.@£21 10s., and £21 15s.@£22 for specials.

December opened with some welcome activity in the consuming branches, and with no plentiful supply; business extending in some cases well into the next year. Early in the month, however, demand was satisfied, and further business was checked by the approach of the holiday season and stock-taking. Some speculative holdings, pressed upon an unsupported market, caused a gradual relapse to about £20 12s. 6d. toward the middle of the month; but producers were in nowise disposed to fol-

tations were £21 for good ordinaries and £21 5s. for specials.

Conveyer System for Disposing of Waste

By Edwin Higgins

Since writing the article on "Stripping Clinton Iron Ore in New York State"[1] I have secured additional information regarding the conveyer used at Ontario Center for disposing of waste material. Sufficient interest attaches to this machine, on account of adaptibility to the work and the rapidity with which it handles the waste, to warrant the following description:

Construction

The conveyer, shown in the accompanying illustration, consists of a platform 36x40 ft., mounted on four 4-wheel swivel trucks which have 33-in wheels on standard 5½x10-in. journals. The truck frames

[1]Eng. and Min. Journ., Dec. 12, 1908, p. 1150.

tion no springs are used, although the journal boxes are the usual type with brasses and oil reservoirs.

On the center of the platform is a superstructure of two trusses with an inclination of 26 deg. on the upper plane; two 6-yd. cars travel on this plane. These cars are handled separately by a double friction-drum steam hoist situated on the platform on one side of the incline. The hoist is a 12½x15 double-cylinder skeleton machine rated at 75 h.p., and is supplied with steam from a 100-h.p. boiler on the opposite side of the incline.

Operation

The loaded cars are each hauled to the upper end of the incline by a single rope, where they run on tracks which cause the rear end to raise until the car is in a vertical position. The dumping position of the cars is 70 ft. above the ground and 68 ft. beyond the side of the platform. The total travel of the cars is 130 ft., and as long as the shovel can fill the cars a round trip is easily made in 30 seconds. This speed, however, is not maintained on account of delays common to steam-shovel work.

quired, viz., a fireman, engineer, and brakeman. The engineer handles the throttle and frictions and hauls the cars to the top, and as soon as they are dumped he instantly releases the drum, which is then controlled by the band brake operated by the brakeman. In this way each car is entirely independent, and can be handled at full speed in either direction without reference to the condition of the other car. In case of needed repairs one car can be operated alone, thus giving at least one-half service.

In addition to the men required on the conveyer a track gang is necessary; this gang prepares the track in advance of the machine. The track has four 100-lb. rails at standard gage and is merely placed on the ground approximately level, but without any ballast.

To move the conveyer, wire-rope blocks with five parts of ⅝-in. cable are used. On the end of the cable is bent a manila rope which is wrapped around the winch heads on the drum shafts. The entire machine, which was built by the Dobbie Foundry and Machine Company, of Niagara Falls, N. Y., weighs approximately 140 tons.

DOBBIE CONVEYER. ONE SKIP IN POSITION FOR LOADING; THE OTHER DUMPING

Survey in 1908

The field work of the United States Geological Survey in 1908 shows great variety and range, as it included investigations of practically all the natural resources and their dependent industries, and extended over the entire country.

Beginning in 1879 with the appropriation of $100,000 for the classification of the public lands and the examination of the geologic structure, mineral resources, and products of the public domain, the duties imposed by Congress on the Survey and the appropriations made for its work have steadily increased until now its field of operations covers the whole country including Alaska. The appropriations for 1908 amounted to $1,782,770, and over 150 parties were in the field. The work ranged from that of the explorer and geographer making reconnaissance surveys in interior Alaska to that of the coal-mining engineer carrying on experimental gas and coal-dust explosions, for the purpose of saving human life, and to that of the geologist determining the presence of coal, water, or petroleum thousands of feet beneath the earth's surface.

Geologic Investigations

The primary work of the Survey is to make a geologic map of the United States. Geologists have been at work during the year in all the coastal plain States, from Maryland to Texas inclusive, investigating the distribution of the rock formations and correlating the underground water-bearing beds. The States of Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida have coöperated with the Federal Survey in this work, paying one-half the cost; Louisiana has similarly coöperated in the investigation of the new Caddo oilfield in that State. In Pennsylvania, detailed studies of the coal beds and the oilfields in the vicinity of Pittsburg and farther up the Allegheny river were made in coöperation with the State; similar geologic work was also carried on south of Altoona and east of the Allegheny front. Indiana also coöperated with the Survey, and advantage was taken of the thousands of recent drillings and of the data procured in many new mines to revise the old State report on this coalfield. In Illinois detailed investigations of the coal and oilfields was continued in coöperation with the State survey as in the past few years. About $20,000 was contributed in 1908 by the various cooperating States for geologic work, the Federal survey furnishing a like amount.

Work in the Oilfields

In the oil and gas surveys in Oklahoma the approximate elevations of all wells in the surveyed districts were obtained by running level lines. As one of the important objects of this work is to determine the oil and gas operators understand the nature and purpose of these surveys, they willingly aided the work by furnishing drill records and other data. In the California oilfield important work has been done classifying public lands, and several temporary withdrawals have been made where oil land was being entered as agricultural land. In the Caddo oilfield in Louisiana, all the Government land has been withdrawn from entry pending an effort to stop the enormous waste of natural gas, estimated at 75,000,000 cu.ft. per day.

Through the economic work of the geologists of the Survey it has become evident that one of the greatest needs of the petroleum industry is a general chemical examination, by uniform methods, of all the crude petroleums of the United States in order that the petroleums in one part of the country may be compared with those of another part. The importance of choosing standard methods of chemical examination for petroleum was seen from the first, so consultations have been held with the principal petroleum specialists of Europe and a system of examinations has been developed which is being practically applied as rapidly as possible.

Prominence of Mining Geology

Mining geology—the scientific study of metalliferous deposits—is now recognized as the basis of the highest type of mine development, so that the demand for Survey geologists to do this work is so great that it is not possible to satisfy it. During the season the Government mining geologists worked in several mining districts in northwestern and northeastern Nevada; in the Randsburg mining district in California; in southeastern Oregon and in the Bohemia district of that State (in connection with the work of the Forest Service); in the Frisco district, Utah; in the Caspar district, Wyoming; in the Breckenridge and the Lake City mining districts, Colorado; and in the district south of Dahlonega, Georgia. Reconnaissances were also made in the Frisco, Pioche, Cima, Hart, Rawhide and Aspen districts. Work was continued on the Shasta County, California, copper deposits; on the Leadville district; on the New Mexico mining district; and on the Joplin and Oklahoma districts.

Classifying and Valuing Coal Lands

The Survey had nearly 100 men engaged during the season in the geological examination, classification, and valuation of the great area of public coal land in the West. They classified 11,500,000 acres of coal land in Colorado, Montana, New Mexico, North Dakota, Oregon, Utah, Washington and Wyoming. The valuation of the coal deposits includes not only the determination of geologic conditions, but also physical tests of efficiency in the Sur-

exhaustion and exportation of phosphates have resulted in the withdrawal of the entire area of public phosphate land, pending legislation by Congress.

Mining and Geologic Work in Alaska

The work of the Alaskan division has embraced investigations of a varied character and has been widely distributed throughout the Territory. Reconnaissance, detailed geologic and topographic surveys and explorations were made as well as special investigations of the gold, copper, and coal deposits. In the placer districts data were collected on stream flow; some general stratigraphic and geologic studies were made; and statistics of mineral production and data on the progress of mining were collected.

Thirteen parties, including 23 technical men and 25 camp hands were engaged in Alaskan surveys and investigations. The field season for the different parties in 1908 varied greatly, but the work was carried on between March and November. Four parties were engaged in geologic work, four in both topographic and geologic surveys, and two in investigating water resources. The areas covered by geologic reconnaissance surveys (maps, 4 miles to the inch) embrace 4850 square miles, detailed geologic surveys (maps, 1 mile to the inch), 668 square miles. Topographic reconnaissance surveys (maps, 4 miles to the inch) were completed of 3975 square miles, and detailed topographic surveys (maps, 1 mile to the inch) of 427 miles. As a result, about 21 per cent. of the reconnaissance topographic base map of Alaska is completed, and about 17 per cent. of the reconnaissance geologic map. These results have been accomplished since 1898.

In the Yukon-Tanana region 21 gaging stations were maintained during 1908; these furnished data on the water resources of 4000 to 5000 square miles. In the Seward peninsula 32 gaging stations were maintained, yielding data on about 2000 square miles.

To consider the work geographically, two parties were in southeastern Alaska, two in the Copper and White River basins, one on Prince William sound, one on the Alaska peninsula, four in the Yukon basin, and three on Seward peninsula.

Among the important results of 1908 were the completion of detailed surveys of the two most important copper districts on Prince of Wales island; the finishing of the reconnaissance survey of copper-bearing areas of the Prince William sound and the Copper-White river regions; and the completion of the reconnaissance survey of the coal deposits in the Alaska peninsula region. The base map of the entire Yukon-Tanana region has been completed, and also the detailed geologic investigation of the Fairbanks placers.

Through this work much new information on the general geology and mineral resources of the Seward peninsula was obtained, while the stream-gaging work in both the Seward peninsula and Yukon-Tanana regions yielded important results on the water available for placer mining.

Twenty-seven Thousand Square Miles Mapped

The first step toward making a geologic map is a topographic survey; the topographic branch of the Survey is, therefore, one of its most active parts. During the last field season 26,994 square miles of topographic mapping was completed; 6024 square miles in the Atlantic division, 6069 square miles in the Central division, 3875 square miles in the Rocky mountain division, and 11,026 square miles in the Pacific division. The surveys included work in 32 States and Territories. Special drainage surveys were made in Minnesota, Mississippi and California. In Minnesota the special drainage survey of the ceded Chippewa Indian lands, authorized by Congress, was completed, 2385 square miles being mapped in 1908. The data will be used in making drainage plans by the Survey as directed by Congress. In Mississippi a topographic map of 1200 square miles of swamp land in the Yazoo delta was made in coöperation with the Tallahatchie Drainage Commission, which will use the data for drainage construction. This survey has been made on the especially large scale of 2000 ft. to the inch, with 5-ft. contour intervals and with 125 elevations established to the square mile. In California the work of mapping the Sacramento valley, including the tule swamps, progressed well; 1054 square miles were mapped with 5-ft. contour intervals on a special scale of 2 inches to the mile.

Notable sections surveyed in the Pacific division are the oil-belt region extending from Coalinga to Mount Hamilton, in California, where the surveyors are still in the field; the Crater Lake National park and the Eugene quadrangle in Oregon; the Carson Sink quadrangle, an area of 3688 square miles in Nevada including the larger part of the Truckee-Carson project of the Reclamation Service; and the Flagstaff quadrangle, Arizona.

In the Rocky mountain division, the Breckenridge Special quadrangle in Colorado, was mapped, and a tablet was set on the summit of Pikes Peak, correcting the mountain's elevation. In New Mexico, 25 miles of the Fort Bayard military reservation was mapped on a large scale with a 10-ft. contour interval. A survey was also made of the Fort Missoula reservation, on a scale of 4000 ft. to the inch with 5-ft. contours.

A large proportion of the topographic work has been done by the Survey in coöperation with States, which pay one-half the cost of the work. The total amount so contributed by the various States is approximately $100,000; the States contributing are California, Mississippi, Illinois, Iowa, Kentucky, Maine, Maryland, Michigan, Missouri, New York, Ohio, Oregon, Pennsylvania, West Virginia, North Carolina, and Virginia. In Mississippi the drainage commission, which is the agency of coöperation, is paying the bulk of the cost. Forest fires in various parts of the country interfered considerably with the map making, the Survey's loss in field work by reason of smoky conditions amounting to about $10,000.

Mine Explosions and Rescue Work

While the National Conservation Commission and others have been educating the public to the fact that there are enormous avoidable losses in the natural resources of the United States, the Technologic branch of the Survey has been quietly demonstrating that many of these losses may be stopped. The investigations made have tended to show not only the waste of natural resources in the mining and consumption of coal, but also the terrible loss of life in this industry. A notable event in 1908 was the opening at Pittsburg, Penn., of the experiment station, established for the purpose of investigating the causes of mine disasters. This station had been in operation for several months before its formal opening early in December and the experiments made there have already shown that many mine disasters can be prevented. At this station, it has been demonstrated conclusively that coal dust is as dangerous an explosive as firedamp. The possibility of coal-dust explosions has been a mooted question among miners, and its solution will go a long way toward reducing fatal accidents in the mines. It has also been shown that many of the "safety" explosives are not safe. The Survey's purpose is to standardize these explosives, so that when a miner explodes a charge of powder he will have some definite idea of what it will do. This too cannot fail to result in a reduction of accidents, and it also means the saving of much coal, as the use of improper explosives makes a great deal of unnecessary slack and dust. An important feature of the experiment station is the gas-filled room where miners equipped with oxygen helmets are being trained in rescue work. Mine owners have been invited to send picked squads of their men to the testing station, where they are taught how to work with helmets. This should unquestionably result in a further saving of life.

Utilizing Fuel Waste

In trying to decrease the waste of coal, interesting experiments are being carried on at the Survey's fuel-testing plant at Pittsburg. This plant is now being successfully operated on "slack" coal costing 88c. per ton delivered and on "roof coal," which is usually left in the mines. These experiments show immense possibilities in the use of fuels and add a considerable amount to the usable coal reserve. The coals are burned in scientifically constructed furnaces, without smoke, and in this way the Survey is furnishing an object lesson to the entire country. Manufacturers and engineers are watching the experiments with keen interest, and in many plants improvements in the coal-burning apparatus are directly attributable to the Survey's pioneer work.

At the fuel-testing plant at Denver, Colo., investigations have proved that practically all the coals of the Rocky mountain fields, when they are washed and are properly treated in the process of coking, will produce coke that can be used for metallurgical purposes. This was not known and, in fact, was not believed before the Geological Survey took up these investigations. The big metallurgical interests were at that time sending East for their coke.

Testing Building Materials

At the structural-materials laboratories at St. Louis, Mo., tests of the strength of the different materials of construction and of the fire-resisting qualities of these materials were continued throughout 1908 and the deductions therefrom given to the public. These tests indicate the possibility of so reducing the amount of material used in public buildings and structures made wholly or in part of reinforced concrete that the cost may be reduced 10 per cent.; for, owing to the present lack of knowledge of the behavior of concrete and of reinforced concrete, high factors of safety involving the use of excessive quantities of material are now necessary in designing structures of this material. The establishment of a fully equipped laboratory at Pittsburg for investigating the chemical and physical properties of clays and clay products has already proved to be of value to the Government in connection with its purchases of such materials.

The nominal strength of detonators, at least those used in Western Australia (E. A. Mann, chief inspector of explosives for that State, *Journ.*, Chamber Mines, West Australia, July 31, 1908) is not rigidly adhered to in manufacture. Missed holes in mines, therefore, may be caused by the detonator cap, for probably the caps furnished in Western Australia, where explosives are rigidly examined, are of at least as good grade as those furnished elsewhere.

The Ural coal production for the first half of 1908 is given in the *Torg. Prom. Gazeta* as 24,577,914 poods against 21,158,845 poods in the same period of 1907.

The Turquoise Mining District, Arizona

By James M. Platt*

The Turquoise mining district is nine miles south of Pearce, Arizona; as it is a highly mineralized area, the camp is rapidly coming into prominence as a future producer of copper. The geology of this part of Arizona has not been mapped, at least so far as I know; consequently I will roughly indicate the geological features of the vicinity. Starting from the granite of the Dragoon mountains, about four miles west of the present active camp, and going east, the general order of occurrence of rocks is: Granite; quartz-porphyries traversed by iron-stained quartz lodes and forming a belt about three miles wide; a range of hills about half a mile wide of rock locally called quartzite, but which I think is quartz-diorite; a limestone belt varying in thickness, but averaging about 1500 ft., in which are the Leadville and the old Great Western mines; a belt of quartzite or quartz-diorite, from 100 to 400 ft. wide; limestone of Carboniferous age about 1500 ft. wide; from there into the Sulphur Spring valley dioritic porphyries.

Taking the different belts in the same order I will describe the work done in each. The vein country (quartz) is entirely undeveloped, although located. In the main ridge of quartzite some turquoise has been developed. On the first quartzite-lime contact, large bodies of sulphide ore have been developed on the 200- and 300-ft. levels of the Leadville mine; most of this ore carries from 3 to 5 per cent. lead and some of it assays from 8 to 12 per cent. This is a stock company, having a capital stock of 600,000 shares of a par value of $1. The stock is held almost entirely by local people, and has not been handled by any outside promoters. In the lime country east of the contact this company has also developed several small veins of galena. Adjoining the Leadville property on the south and on the same quartzite-lime contact is the old Great Western mine. This property has in the past produced over $250,000 worth of sulphide and carbonate ore, all from above the 300-ft. level, but during the last three or four years it has produced very little ore.

Next to the east in the first lime belt is the property recently bonded by Martin Costello to the Copper Queen Consolidated Mining Company for $200,000. In this property good carbonate ore has been developed from a shaft 250 ft. deep; the mine is now being studied by the Copper Queen engineers.

On the next lime-quartzite contact the Calumet & Arizona Mining Company has several claims bonded; in them it has developed large amounts of carbonate ore. The Great Western property extends to this contact, and some fine carbonate ore has been developed from that company's shaft. It is reported that the Calumet & Arizona company has taken over the Great Western property at a price of $750,000, but I am unable to obtain exact information.

In the lime belt just east of this last contact there is a big "iron blowout," or gossan, covered by the Maid of Sunshine claim; under this gossan a large amount of carbonate ore has been developed. This claim together with its north extension is owned by the Leadville company, but has been bonded by them to the Calumet & Arizona company for $200,000; $10,000 being paid at the time of signing the option. South of the Maid of Sunshine and adjoining the Great Western property on the east are 20 or 25 claims in lime country with several good gossan cappings. These have been bonded by D. W. Brown and his brothers, to the Copper Queen company for $200,000.

Many other claims in the camp have been changing hands, and people are talking of town sites. There are several good locations available, but as yet almost everyone lives in a floored tent near the various operations. Many men come to the district seeking work, but few are put on. Development is being pushed by the three main companies, and at present all the ore comes from this development work, for all are waiting the advent of a railroad. A railroad can be easily built either from Pearce, whence a line runs to the Southern Pacific, or from Douglas, about 34 miles to the southeast. As is well known, the Copper Queen and Calumet & Arizona smelters are in Douglas, on the El Paso & Southwestern railroad. It, therefore, is more probable that a branch will be built from Douglas rather than from Pearce into the Turquoise district. This branch would be very easy of construction, as it would pass through a smooth valley, the only difficulty being to provide for drainage in the rainy season.

The name of this camp is in debate. The original locators stick for "Leadville," but the Calumet & Arizona company calls its little town "Courtland."

*Mining engineer, Tombstone, Arizona.

The Cement Industry in 1908

The following statement regarding conditions in the American portland cement industry during the year 1908 has been prepared by Edwin C. Eckel for the U. S. Geological Survey. Although detailed figures are not yet obtainable, an estimate based on the information available indicates that the production of portland cement in the United States was somewhat less than forty million barrels. This compares as follows with the output of recent years: 1905, 35,246,812 bbl.; 1906, 46,463,424; 1907, 48,785,390; 1908 (estimated), 40,000,000.

The falling off from the 1907 output was heavy, and is particularly notable because it is the first decrease shown in any year by the American cement industry since its inception. The decrease was not uniformly distributed throughout the country, for New York, Pennsylvania and New Jersey will probably show the highest percentages of loss, while in some portions of the West and the Middle West the decrease was relatively slight.

During the year several small companies went into the hands of receivers and the financial stress also led to a change of control in a group of plants operating chiefly in the Pacific States. A fortunate effect of the depression was that it put a stop, temporarily, to the flotation of fraudulent or doubtful cement securities; though with improvement in general business conditions it is likely that promotion schemes will again be taken up on an even larger scale than before the depression.

The year 1909 opens with heavy stocks of cement on hand at most mills, but with good prospects for a steady, though slow, revival in the cement trade. It is unlikely that this revival will be sufficiently rapid to push mills to their capacity during the year, and it is, therefore, possible that the high record for output made in 1907 will remain unbroken for another year at least. The total maximum capacity of existing plants is now about 60,000,000 bbl. a year. Despite the business depression, or perhaps partly because of it, there were a number of important technical and industrial developments in the cement industry during 1908, and others are still pending.

C. O. Schmitt (*Journ.* Chem., Met. and Min. So., of South Africa, July, 1908) suggests that at mines where, during part of the day, as for instance, when blowing out powder smoke between shifts, compressed air is used for ventilation, the low- and high-pressure cylinders should be arranged so that at such times each cylinder can exhaust directly into the air main. This would, in most cases, add 50 per cent. to the volume of air delivered into the main, and where a certain amount of air must be supplied the coal consumption would be reduced one-third. The air, as it passes through only one cylinder, would be less contaminated with oil.

The capacity of the De Bavay process plant at the North Broken Hill mine, New South Wales, according to *Aust. Min. Stand.*, June 3, 1908, is being increased to 1500 tons.

The South Lorraine Silver District, Ontario

A Partially Developed District Which Promises Future Importance; Prospecting on 10 Claims Shows a Geology Similar to That of Cobalt

BY WILLIAM B. PHILLIPS*

The unsurveyed portion of Lorrain township, east and southeast of Cobalt, which is known as South Lorrain, is the scene of considerable activity. The district is best reached from Haileybury by boat on lake Temiskaming, but when navigation has closed it is accessible over the winter road from Haileybury, by way of the Green-Meehan, Martineau bay and the old mission. From Haileybury, by boat, the distance is about 22 miles, the trip occupying 2½ to 3 hours. The landing place on the lake is known as Silver Center, near which the Government dock is being built, with promise of completion next summer. There is a private dock, a mile below, known as Maloney's.

From Maloney's there is a fair road into the heart of the new district, 4 miles west, and another road from the Government dock, or "666," as it is called. The country rises rapidly from the lake and reaches an elevation of 500 to 600 ft. above the lake in a distance of 4 miles.

Geology

Roughly speaking the new district is in the contact between the diabase (and gabbro) and the series known as Keewatin, the oldest recognized formation. The Keewatin here is characterized by the usual greenstones, quartzites and conglomerates that distinguish it in the Cobalt district proper, 20 to 25 miles northwest. On the lower road, from Maloney's, diabase and gabbro principally are seen, while on the upper road, from the Government dock and Sullivan's, the rocks are, for the most part, Keewatin. The line of contact runs between these two roads and may be seen near the properties known as the Williams, Keeley, Elkhart, Emerick, Haileybury Silver, etc., and generally to the west of Loon lake.

The Principal Claims

Active work is now in progress on the following properties, all within 1½ miles of each other: Jowsey (now known as the Keeley mine), Haileybury Silver, Keeley, Gibson, Ferneri, Taylor, Nugget, Elkhart, Williams and Wettlaufer. The Keeley mine and the Haileybury Silver have about three or four cars of ore sacked and ready to ship. Excellent veins containing smaltite and native silver have the bottom of a trench less than three feet deep. This vein is not as wide as the famous Lawson vein near Kerr lake, in the Cobalt district, nor exposed over as great a distance as the native silver vein on the La Rose property, but the fineness of the silver is said to exceed that of either of these localities. It is reported, but I am unable to quote the authority, that in general the quality of the silver from this new district is superior to that from the Cobalt district, and that less smaltite, cobaltite, niccolite, etc., are found. Whether this is true or not it is certain that a more beautiful sight than the Wettlaufer vein, or some of the Keeley and the Haileybury Silver ore would be hard to find.

In this district the silver occurs largely as flattened plates and sheets and appears to run into the wall rock. On either side of the calcite (or calcite and quartz) veins, the wall rock is distinctly worth saving, many of the planes of fracture showing plates of silver. Just prior to my visit a 900-oz. assay had been obtained from an open cut on the Haileybury Silver property and the material did not seem to be so rich, judging from a cursory examination. But a closer inspection showed that it was penetrated by fine plates of silver, very thin and crusted in appearance. These were distributed through the wall rock of Keewatin greenstone having a somewhat slaty structure; they were found not only along fracture planes, but even in the body of the rock itself and not always in any close association with calcite. On the West Keeley property the rock is also Keewatin and here some good specimens carried native silver in quartz.

In fact silver-bearing quartz is more prevalent in this district than in the Cobalt district proper and the association of this mineral with the silver is more pronounced. Some of the calcite and quartz veins carry galena and this is often barren of silver, as is also the pyrite and chalcopyrite associated with the galena.

It is a curious circumstance (proved, however, by more than one prospecting pit) that the bedrock on top of some of the hills is covered to a depth of 10 to 20 ft. with earth carrying loose and [illegible] Keewatin hills do not appear to carry so heavy a cover of earth, etc.

After the ice on lake Temiskaming has become thick enough for travel and when the winter road from Haileybury is open for traffic, shipments from this new district may probably attract attention to it.

Fuel, Timber and Power

The district is fairly, although not abundantly, timbered and there is no lack of water. The winter is severe, requiring snug camps and plenty of wholesome provisions. Those who own claims and wish to develop them are strongly advised to build camps early and gather and pile wood for fuel and timber for mine purposes. The forest fires that swept through that region during the last summer did little damage to mine timber, but they caused much of it to fall. The timber is scorched and blackened, but the heart is still sound and the "lumber jacks" are hard at work, securing all they can get. In the case of fallen timber it seems to be "first come, first served." The result will be that in addition to the standing pine which the lumbermen are entitled to, they will take everything they can find. Next spring when camps are to be built and timber must be provided for development work, etc., some of the claims will have difficulties.

Of interest in connection with the further development of the district is the power plant on the Montreal river that proposes to pipe air to the mines around Cobalt. A great deal of money has already been expended on this undertaking and it is now said to be so far along as to warrant the expectation that the power will be available next summer. This new district is much nearer the power plant than is Cobalt and it may be able to secure power at a lower cost. If, however, this should not be the case there is a fine waterpower at "The Notch," near the mouth of the river, that could be utilized either for compressed air or for electric power. It is not more than 7 miles from the Notch to the heart of this district. Cheap power would greatly aid the development of this district. It would solve the question of water supply, by no means an unimportant one even in this land of [illegible]

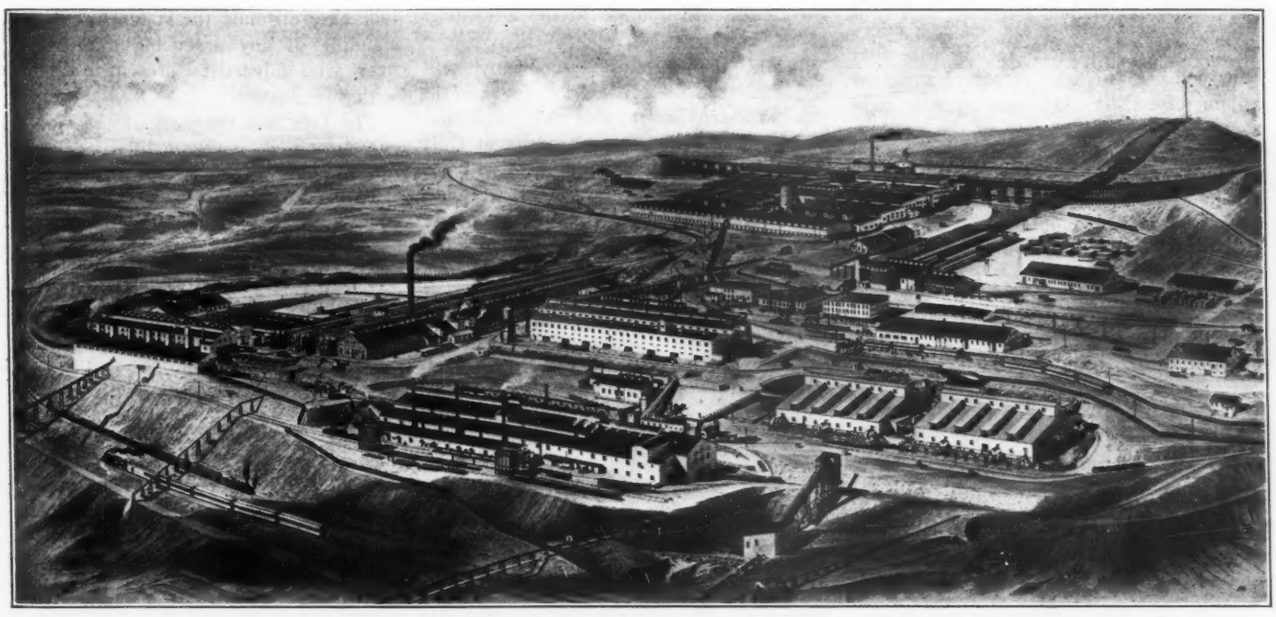
from water and the ground being frozen, stands better. Trenching is characteristic of the Ontario silver regions and is necessary. While the general course of the veins may be known—in this district they bear northeast-southwest—there are other veins that run north-south and east-west. Each promising "draw," or depression, must be prospected by trenching and pitting and a well opened property looks like a freshly plowed field. A prospector in the Cobalt district put the matter well when he said that a bucket of water and a broom were as necessary as a pick and shovel. Not every crack is worth investigating, but, as a rule, every fissure that shows calcite, especially if Cobalt bloom is present, should be opened. Cobalt bloom (hydrous arsenate of cobalt) is usually associated with silver. It is to be regarded as a more positive indication than annabergite (hydrous arsenate of nickel) and wherever it is found in association with calcite considerable work is warranted. The mud seams that lie next to the wall are also of importance in this connection. These are generally of a red-brown color and have a pasty consistency; they may go down to a considerable depth. Some of them carry considerable native silver and they are by no means to be neglected. On panning this mud many small fragments of wall rock and calcite are found with grains of yellowish sand and black iron sand. The silver in this material is nearly always

the chief ore of this new district yet argentite is also present and some cobaltite, smaltite and niccolite are also silver-bearing.

This district is likely to come into prominence as a silver producer within the next 12 months. It is easily accessible, has favorable geological conditions and is a promising field.

The Washoe Smelter

The accompanying illustration of the Washoe smelter of the Anaconda Copper Mining Company shows all the departments of this enormous plant. Its chief supply of ore is obtained from the mines of the Amalgamated and subsidiary companies at Butte, Mont. The plant has a capacity of 10,000 tons of ore per day, and is the largest of its kind in the world. The illustration tells its own story.



WASHOE SMELTER, ANACONDA COPPER MINING COMPANY, ANACONDA, MONT.

Shaft Sinking Through Faulted Ground

C. B. Saner (*Journ.*, Chem., Met. and Min. Soc. of South Africa) gives an account of how, at the Turf mines, sinking through heavy cross-faulted ground was accomplished. The shaft in question is a seven-compartment one, and the bad ground was encountered at about 2650 ft.

The method of sinking employed was as follows: Six-foot timber sets were used, bearers or foundation girders being placed under each end piece and every alternate divider or vertical at about 100-ft. intervals. When the running ground was encountered 3-ft. sets were substituted. The faults, being nearly vertical, caused the rock to scale off continually. Finally a set of three bearers, 9 in. wide under the end pieces and 7 in. wide under the dividers by 27 to 36 in. deep, all firmly wedged into hitches cut from 1 to 4 ft. deep were placed to take the weight of the timbers. A floor was built upon these, leaving only the hoisting compartment open; the shaft was then lined to near the top of the caving ground, and waste, hoisted from below, was filled in behind the lagging.

When more bad ground was encountered farther down three diagonal supports were placed below and supporting the bearers; two of these were 36 in. deep, the other only 24 in. They were set in cement in hitches cut about 5 ft. in the wall of the shaft and were, of course, made to fit as nicely as possible for they had to clear the steel guides. These cross-braces served to hold the worst part of the wall. Sets at 3-ft. centers, close lagged with 3-in. material, and with extra blocking behind every divider, firmly wedged in place and afterward filled in behind with waste, were continued until

Pyrites in 1908

By J. J. Rutledge*

Conditions in the pyrite trade during the year 1908 were very much better than for the preceding year, and indeed much better than the outlook at the beginning of 1908 seemed to promise. Shipments were much larger than during the preceding year, and, as the market will only absorb a certain amount of pyrite, prices were cut to a considerable extent in order to get the business. Moreover, as the demand was not materially greater than during 1907, prices could not be maintained, and considerable cheap material was sold. It is hardly probable that 1909 will experience as low prices as the past year, for in 1908 several of the mines in Canada and the United States sold their product very nearly at the cost of production.

Generally the acid manufacturers make contracts for three or more years in advance, in order to insure them a constant supply for their furnaces; this fact has helped to tide over what would otherwise have been a bad year, for some of the producers. Unfortunately several of the largest contracts expire at the beginning of 1909, and, owing to present market conditions, as well as the recent money panic, the acid makers are not in a hurry to make new contracts, feeling sure that they will be easily able to secure sufficient supplies for their use no matter what new developments may appear in the market.

The Tennessee Plant

The close of the year finds the pyrite miners and acid manufacturers anxiously watching the developments at the new acid plant of the Tennessee Copper Company, at Ducktown, Tenn. The 1000-ton acid plant, recently put in operation at this plant, has caused considerable apprehension. The fact that the Ducktown Company has also under way an acid plant equal in capacity to that of the Tennessee Copper Company, has caused the acid men to delay in making new contracts for pyrites, thinking that they may ultimately be able to secure acid from the Tennessee company at such a price that they will not be under the necessity of making their own acid.

The formation of a new fertilizer combination to take over the plants which were not taken over by the two preceding combinations, to utilize the acid made by the Tennessee company, does not seem to progress rapidly, doubtless owing to the fact that the terms offered some of the largest independent producers for their plants, does not seem attractive to them. While ultimately, to be sure, the large production of acid by the copper company, will greatly cheapen acid, and correspondingly demoralize the market for acid, still it is not thought that this will occur for some time, as the company would have little to gain by such a course. The cheapening of acid will have a stimulating effect on all industries which employ chemicals. Especially will it benefit the farmer, for he will ultimately secure cheaper fertilizers. The fact that such States as Wisconsin, Illinois and Ohio are now commencing to use fertilizers, is of great importance. The field for the fertilizer manufacturer of the future is the Middle West, and some manufacturers are already planning to erect plants at such points as St. Louis.

Another probable effect of the reduction in the cost of acid will be that many small manufacturers of fertilizers, located in the farming districts, will purchase the cheap acid from the large acid makers and mix their own fertilizers. This has heretofore been done in a small way, and the advent of cheaper acid will doubtless result in more of this sort of manufacture.

The zinc smelters in the Middle West, who make acid as a by-product, and who have usually heretofore disposed of their surplus in the Southern States, will now, of course, be compelled to dispose of their product elsewhere, since the copper company will supply this market. The erection of fertilizer plants at such points as St. Louis, will operate to the advantage of the zinc smelters.

While the Tennessee company will doubtless control the market for acid in the Southern States, and may even displace considerable Spanish pyrite at Gulf and Atlantic points, freight rates will not permit of its shipment north of the Ohio river. It is cheaper to transport pyrite than acid, and this fact will limit the markets of the new acid plant.

It is not certain that the present acid makers would be willing to dismantle their plants and depend wholly upon the new works for their supply of acid, since such a course would place them wholly at the mercy of the large acid producer.

Effect on Pyrite Miners

It is a singular fact that those pyrite mines which have always held securely a certain local market adjacent to themselves, seem more strongly intrenched than ever, for only in one or two instances does the new order of things in the acid business affect them.

The recent developments in pyrite mines are in Canada and Georgia, the former, as in past years supplying a high-grade material, shipped mostly as lump, while the latter is producing almost altogether fine mineral. At every mine methods of mining and concentration are being constantly improved, and the cost of producing gradually lowered. Breaking is gradually coming to be done by mechanical means instead of by hand, the Blake type of crusher being used at some mines, while at least one new plant is using a Gyratory crusher.

The outlook for 1909 is not very encouraging, since producers of acid are not inclined to make forward purchases, but it is thought that the market will ultimately work out satisfactorily.

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Bogus Mining Experts

Employment by the U. S. Geological Survey, for even a short time or in any capacity, appears to have a commercial value that is rated high, says that organization in a recent press bulletin. Even the cooks and teamsters of the field parties refer proudly to their connection with the Survey and reap the reward of popular credit that attaches to their public service.

The advertisement of such connection after it ceases, however, has sometimes been the source of trouble or embarrassment to the Survey, especially where it is used for the furtherance of doubtful mining schemes, and the Survey desires to give emphasis and wide publicity to the fact, now fairly well known, that no member of its scientific corps is allowed to do private professional work in the United States during the period of his employment. The public is warned to look carefully into the statements and the standing of any practicing mining engineer who advertises present connection with the Survey.

The fact that the staff of the Geological Survey is not composed exclusively of geologists is too often overlooked. Of the 1200 or more persons connected with it in 1908, not more than 10 per cent. are geologists, and not more than 1 per cent. are engaged in work whose character implies ability to determine the merits of a mining prospect of enterprise.

Flotation Process Litigation

In the case of the British Ore Concentration Syndicate, Ltd., and Alexander Stanley Elmore *vs.* The Mineral Separation Company, Ltd., Justice Neville, of the High Court of Chancery, pronounced judgment to the effect that the Mineral Separation Ltd., was not infringing the patents of the plaintiff. The latter appealed from this decision. The Lord Justices of the Court of Appeals rendered judgment Dec. 2, 1908, to the effect that the Mineral Separation, Ltd., was not infringing the patents of 1898, but was infringing the patents of 1891. The case will now probably go to the House of Lords, which is the final court of appeals.

It is not always an advantage to connect several mines, since the farther air travels through mine workings the more it becomes vitiated.

The London Silver Market in 1908

The following concise review of the market in London, where most of the silver produced in the world is handled, is made by Messrs. Pixley & Abell, of that city.

The Course of Prices

The heavy fall in silver, which took place toward the close of 1907, was followed during the opening months of this year by a reaction, due chiefly to large purchases for the Indian bazaars, and during January the quotation rose to 27d., the highest of the year, an advance of 2⅛d. from the closing price of 1907. This steadiness continued until the beginning of April when weakness again set in, and from that time the tendency of the market, with the exception of a temporary advance in June, was downward until December 2, when 22d., the lowest quotation of the year, was touched. From this point the market steadily improved until the end of the year, when the closing quotations were 23 3/16d. for spot and 23⅛d. for forward silver. Important purchases for China and some buying for India, where the position has of late become more satisfactory, account for this sharp advance during the last few weeks. The average price for the whole year is 23 13/32d. per ounce.

Shipments to India

Shipments to the Indian bazaars were throughout the year on an unusually large scale. The net imports, chiefly from this country, into India probably amounted to 70,000,000 oz. against 44,500,000 in 1907, and 32,750,000 in 1906. This demand may to a great extent be attributed to a desire on the part of the natives, attracted by the low prices, to convert their hoards of rupees into bar silver, and this action has doubtless been partially responsible for the increase of rupees in the Indian treasury. There were an unusual number of marriages during the early part of 1908, as in July commenced a period which will extend until October, 1909, and which is considered by the Hindoos to be unpropitious for matrimony, and this fact doubtless stimulated purchases during the earlier months. The cheapness of silver has also probably conduced to the purchase of this metal instead of gold, of which only about £3,100,000 in bars has been sent to India in 1908, against £5,700,000 in 1907, the difference representing in silver some 25,000,000 ounces.

Indian speculators have during the last six months operated largely both in London market and Bombay. Though these speculative accounts have not yet been lipuidated the immediate result has been to transfer large amounts of silver from London market to Bombay, where, in spite of some substantial purchases for China, the stocks are still heavy, amounting, it si estimated, to nearly £400,000, while in addition there are £840,000 now in transit.

The Indian Government made no purchases during 1908. Its holdings of rupees have largely increased and amounted at the beginning of December, when the highest point was reached, to about 29 crores in the paper currency reserve and to 18½ crores in the gold standard reserve. Since then, owing to the opening of the export season, the paper currency reserve has fallen to just under 28 crores (£18,500,000), and the gold standard reserve to 18 crores (£12,000,000). At the commencement of the year the Government's holdings were 21 crores (£14,000,000) in the paper currency reserve and 6 cores (£4,000,000) in that of the gold standard. Under these conditions the prospects of further purchases during the coming year are rather remote. To coin 1 crore of rupees requires 3,437,500 fine oz. silver. As 15 rupees equal £1, a crore of rupees equals £666,666⅔.

Chinese Buying and Selling

Though China has at times been a seller, and has shipped about £220,000 in sycee to London for sale, yet she has, on the whole, been a considerable buyer. The low exchanges ruling in China have greatly stimulated the export trade, and adversely affected the import trade so that the banks have been forced to buy silver as cover for or as a hedge against their exchange operations. Part of these purchases have been shipped to China, but a large amount is still under the control of the China banks. Whether this will be re-sold or shipped to China remains to be seen. In addition to her purchases in London, China has bought fair amounts in Bombay and has as well received regular shipments amounting to about £1,000,000 from San Francisco. An important feature in the future will be the effect of the prohibition of the import of opium into China, should this result from the recent efforts to suppress the use of this drug. Unless the import of other commodities should greatly increase, it would seem probable that China will be a still more important buyer of silver than heretofore.

In Shanghai the stock of sycee is unusually heavy, amounting to about 19,000,000 taels, while in addition there are 10,000,000 Mexican dollars.

Mint Buying

A convention was signed in November by the members of the Latin Union whereby it has been arranged to increase the circulation of subsidiary coins from 12 to 16 fr. per head of the population. This convention comes into force on April 1 next, and the increase is to be made at the rate of 60 centimes per head per annum. There are also provisions to allow Italy and Greece, where the circulation is now below 60 centimes per head, to bring the circulation up to that amount. As a large part of the silver required will be provided by re-coining five-franc pieces, or coins of similar value, the amount of new silver required will be unimportant. Excepting 5000 kg. bought during December, the Paris Mint made no purchases by tender in 1908. Silver, however, was brought for French account during the earlier part of the year, and this presumably was required for colonial coinage. Switzerland has been a moderate buyer at times, while Portugal bought £250,000 in October.

In Germany a bill has passed the Reichstag for the purpose of increasing the silver currency of the country by 5 marks per head during the next five years. This is estimated to require about 1,250,000 kg. of silver; but so far, we understand no purchases have been made.

During November, the Mexican Government offered to buy 5000 kg. monthly for currency purposes.

Effect of Low Prices

The low average price of silver, which has ruled during the last 15 months, has, no doubt, caused some diminution of production. Where ores are mined principally for copper, lead or other metals, and silver is but a by-product, low prices for silver can have had little effect, but many of the poorer mines, especially those which depend mainly on the production of silver, have certainly reduced their output. Against these reductions must be set the increased production from the Cobalt district of Canada, but it is probable that, when reliable figures are available, the world's production will show some decrease.

The Future

With silver at low level—almost down to that of 1902-3, when 21 11/16d. was the lowest quotation touched for spot silver—it becomes interesting to review the present situation and consider the prospects for the future. Though the Indian government is unlikely to be a buyer for some time to come, and though China has unusually large holdings of silver, the larger offtake by the Indian bazaars and the possible falling off in production will, in all probability, suffice to prevent any further material decline. Much, however, will depend upon whether China resells any of the silver under her control in London, or whether fresh purchases are made on her behalf.

An alloy of iron, cerium and lanthanum will give off luminous sparks when struck with steel, the sparks being capable of igniting illuminating gas. The behavior of this alloy varies with the percentage of iron, the maximum sparking effect being observed when the iron is about 50 per cent. The sparking phenomenon is brilliant.

Standard Oil Companies

The following list of companies controlled by the Standard Oil Company of New Jersey, the most complete list of the kind ever made available for public inspection, was compiled by the New York *Sun* from the exhibits made in the present proceedings of the Government against the company:

I. COMPANIES WHOSE STOCK IS OWNED DIRECTLY BY THE STANDARD OIL COMPANY.

Name.	Total Capital Stock.	Per Cent. Owned by Standard.
Anglo-American Oil Co., Ltd.	$5,000,000	100
Atlantic Refining Co.	5,000,000	100
Bedford Petroleum Co.	350,000	99.3
Borne-Scrymser Co	200,000	99.9
Buckeye Pipe Line Co.	10,000,000	100
Carter Oil Co.	2,000,000	100
Chesebrough Mfg. Co.	500,000	55.5
Continental Oil Co.	300,000	100
Colonial Oil Co.	250,000	99.7
Crescent Pipe Line Co.	3,000,000	100
Clarksburg Light & Heat Co.	100,000	51
Deutsch - Amerikanische Petroleum Gesellschaft.	2,250,000	100
Deutsch - Amerikanische Petroleum Gesellschaft (share warrants).	5,250,000	99.9
Empire Refining Co.	100,000	78.5
Empreza Industrial de Petrollo	500,000	70
Eureka Pipe Line Co.	5,000,000	100
Forest Oil Co.	?	?
Gilbert & Barker Mfg. Co.	40,000	100
Galena Signal Oil Co., pfd.	2,000,000	74.4
Galena Signal Oil Co., com.	8,000,000	70
Hazelwood Oil Co	?	?
Hope Natural Gas Co.	500,000	100
Indiana Pipe Line Co.	1,000,000	100
Interstate Cooperage Co.	200,000	100
Lawrence Natural Gas Co.	450,000	100
Mahoning Gas Fuel Co	150,000	99.9
Marion Oil Co.	100,000	50
Mountain State Gas Co.	500,000	100
National Transit Co.	25,455,200	99.9
New York Transit Co.	5,000,000	100
Northern Pipe Line Co.	4,000,000	100
Northwestern Ohio Natural Gas Co.	2,775,250	59.4
Ohio Oil Co.	10,000,000	99.9
People's Natural Gas Co.	1,000,000	100
Pennsylvania Lubricating Co.	50,000	60
Pittsburg Natural Gas Co.	310,000	100
Romano-Americana	2,500,000	100
Reserve Gas Co	2,225,000	50
Raffinerie Française	80,000	100
River Gas Co.	190,000	52.6
Solar Refining Co.	500,000	99.8
Southern Pipe Line Co.	10,000,000	100
South Penn Oil Co.	2,500,000	100
Southwest Pennsylvania Pipe Lines.	3,500,000	100
Standard Oil Co., California.	17,000,000	99.9
Standard Oil Co., Indiana	1,000,000	99.9
Standard Oil Co., Iowa.	1,000,000	100
Standard Oil Co., Kansas	1,000,000	99.9
Standard Oil Co., Kentucky	1,000,000	99.9
Standard Oil Co., Nebraska	600,000	99.9
Standard Oil Co., New York.	15,000,000	100
Standard Oil Co., Ohio	3,500,000	99.9
Swan & Finch Co.	100,000	100
Underhay Oil Co	25,000	98.8
Union Tank Line Co.	3,500,000	99.9
Vacuum Oil Co.	2,500,000	100
Waters-Pierce Oil Co.	400,000	68.6
West India Oil Refining Co.	300,000	50
West Virginia Oil Co	200,000	50.6
West India Oil Co	100,000	99.3
Washington Oil Co	100,000	71.4

II. COMPANIES WHOSE STOCK IS OWNED PRIMARILY BY SUBSIDIARY COMPANIES.

Petrolifere Ghent	20,000	74.5
Petrolifere Nationale	10,000	100
Petroleum Raff. vorm August Korff	375,000	54.6
Societe Anonyme H. Reith Co.	412,500	61
Rheinische Petrol. Actien Gesellschaft	250	100
Street Tank Wagon Business-Duren	4,250	71
Actien Gesellschaft Atlantic.	287,500	60
American Petroleum Co.	3,140,000	51.3
Gibraltar Petroleum Co.	25,000	100
Imperial Oil Co., Ltd.	4,000,000	83.1
Det Danske Petroleums Aktieselskab	756,000	51.3
Tidewater Oil Co	20,000,000	31.1
Tank Storage and Carriage Co., Ltd., pfd	300,000	100
Tank Storage and Carriage Co., Ltd., ordinary	42,195	100
Societa Italo-Americana pei Petrolio	1,000,000	60
Aktieselskabet Ostlandske Petrol. Cie.	162,000	9.2
Krooks Petrol. and Olje Aktiebolag.	270,000	10
Skanska Petroleums Aktiebolaget	135,000	60
Svenska Petroleums Aktiebolaget	27,000	75
Sydvenska Petroleums Aktiebolaget	98,550	24.7
Vestkustens Petroleums Aktiebolag	177,500	15.3
Koenigsberger Handels Compagnie	575,000	49.8
Petroleum Import Compagnie	80,000	100
Schweizerische Petroleum Händels Gesellschaft	60,000	60
Societe Anonyme Petrolea.	80,000	66.5
Wachs. & Flossner Petrol. Gesellschaft.	25,000	100
Westphalische Petroleum Gesellschaft.	25,000	100
S. T. Baker Oil Co.	50,000	100
Galena Oil Co.—Société Anonyme Française	40,000	100
Queen City Oil Co., Ltd	200,000	87.4
Connecting Gas Co.	825,000	49.9
Cumberland Pipe Line Co	1,000,000	99.9
East Ohio Gas Co.	6,000,000	100
Franklin Pipe Line Co.	50,000	39
New Domain Oil and Gas Co.	1,000,000	99.9
Prairie Oil and Gas Co	10,000,000	100
St. Paul Petroleum Tanks (Lim.)	250,000	55
Societa Meridionale pel Commercio del Petrolio	120,000	?
Societa per gli Olii Minerali	156,000	52.1
Société Turisienne des Petroles	80,000	65
International Oil Co., Ltd.	2,750,000	99.4
Vacuum Oil Co., Proprietary Limited.	500,000	100
Vacuum Oil Co., Reszvenytarsasag	2,100,000	100
Vacuum Oil Co., Limited	275,000	99.9
Vacuum Oil Co.—Société Anonyme Française	400,000	100
Deutsch—Vacuum Oil Co.	625,000	100
Vacuum Oil Co.—Societa Anonyme Italiana	100,000	100
Vacuum Oil Co.—Aktiebolag	27,000	96.6
Taylorstown Natural Gas Co.	10,000	70
Total	$229,963,195	
Standard Oil Co. of New Jersey	98,338,300	
Grand total	$328,301,495	

Of course to a certain extent the capital stock of the Standard Oil Company of New Jersey represents a repetition of some of the recorded capital stock of certain of the subsidiary companies.

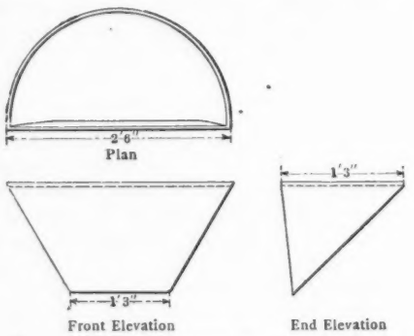
Rhodesian Gold

Completed returns from the Rhodesian Chamber of Mines value the gold pro-

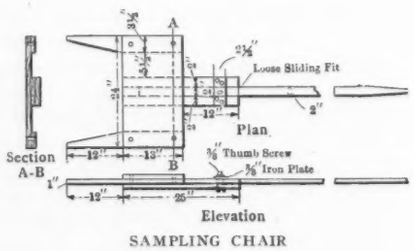
Sampling Devices

In sampling shafts and winzes two devices, described by H. E. Hooper in *Bull.* 49 of the Institution of Mining and Metallurgy, are useful. One is a chair with an adjustable arm projecting from behind so that by means of this arm and a thumbscrew the sampler can secure himself at any point in the winze or shaft. The projections in front serve as the forward braces. The chair is swung by four short ropes from the windlass cable.

The bag for catching samples, shown in an accompanying illustration, is semicircular in shape. The top consists of a semi-circular loop of ⅜-in. round iron to which a canvas bag is sewed so that it falls vertically from the straight edge of the hoop. The semi-circular side is convenient in catching the sample from



SAMPLING BAG



SAMPLING CHAIR

ordinary depressions, the straight side for regular faces, and the corners for acute depressions. When used in conjunction with the chair the bag is attached by a cord from the center of the circular side to the rope above the sampler's head so that when the back of the bag rests against the sampler's knees the bag is horizontal.

In Australia considerable State aid is given to mining. In Western Australia there are 29 State stamp mills and 21 State cyanide plants. Prior to Jan. 1, 1908, 505,286 tons of gold ore was treated, and gold amounting to £2,036,156 was ex-

The Zinc Corporation, Ltd.

This company was organized several years ago to deal with the tailings at Broken Hill, of which it purchased several million tons. H. C. Hoover was largely instrumental in organizing the company and has been its technical director. It was the intention to employ the Potter flotation process, but this proved a failure and the company passed through a series of experimental vicissitudes which carried its fortunes to a low ebb. Under the orders of Mr. Hoover the Elmore vacuum process was finally installed, and from the beginning of its application in 1908 the indications have pointed to success. At the end of 1908 it could be pronounced that both the process and the Zinc Corporation are successes. This is a great, and well-deserved triumph, for Mr. Hoover. In this connection the statement made by him at the annual meeting of the company, last July, is of peculiar interest. In substance it was as follows:

The ore at Broken Hill contains lead, zinc and silver. The mining companies there crush this ore to the fineness of sand and extract from it, by water concentration, about 60 to 70 per cent. of the lead and silver contents. The residues from this treatment, which are sent to the dumps, contain, therefore, practically the whole of the zinc and between 30 and 40 per cent. of the original lead and silver in the ore. We have already bought and paid for a million tons of these residue dumps, and we have the right to buy some millions of tons more. The residues we are treating at the present time are those from the Block 10 mine, and they average about 20 per cent. of zinc, about 8 oz. of silver, and 5 or 6 per cent. of lead. We take the residues from these old dumps by our own railway and dump them into large bins which we have prepared underneath the track at our works. From here the material is carried by a belt-conveyer to bins at the top of the mill. Thence they pass to Huntington mills and grinding pans. After this regrinding, the material passes to agitators, where it is mixed with oil and sulphuric acid, and is drawn from the agitators through the Elmore vacuum machines which deliver a mixed zinc, lead, and silver concentrate.

The second stage of the treatment is the separation of the lead from the zinc in this mixed concentrate, making one in which zinc predominates and one in which lead is the principal content. The zinc smelters will pay only for lead in excess of 8 per cent., and then only half the value of the lead. Likewise, they will pay only 1s. 3d. an ounce for the fact, he penalizes us if we have over 12 per cent. zinc in our lead.

The average contents of the mixed concentrate is about 43 per cent. zinc, 12 per cent. lead, and 16 oz. silver. From this we are now obtaining lead concentrates at the rate of 230 tons per month, and by doing so we have increased the contents of the zinc concentrates from 43 per cent. to 47 per cent. zinc. On our present output, if we sold the mixed concentrate as it stands, we should realize about £3500 less than we do realize by first separating a portion of the lead. On the basis of our last week's output we are earning a net sum of £7000 per month above all expenses, out of which about £3000 should be set aside for cost of tailings worked up, or a net amount of about £4000 per month, or £48,000 per annum profit. I am in this taking metals at the bedrock prices I have mentioned (zinc, £19¼ and lead £12½) and taking working expenses at their average for June.

This profit is, I believe, capable of very important increase from many directions, and it is the directions from which these increases may be anticipated that I wish to make clear. First, the working expenses are always high at the initial stages of a new plant. Although our plant is absolutely mechanical, and no human hands touch the material from the beginning to the end, it takes months to train men and organize them to the best advantage. In this business men have had to be trained from the ground up, as this is entirely a new business in which no men of experience can be obtained. Moreover, we have been buying water, and we shall soon have our own supply for at least part of the year. Our expenses at the start were about 14s. per ton, and for the month of June were reduced to 12s. 3d. per ton. I believe it will be ultimately decreased to 8s. per ton, which would give an additional profit of over £2500 per month. Second, the mill is treating about 13,000 tons per month. I believe that by gradually strengthening the weaker links of the plant this can be increased by 1000 or 2000 tons a month. This would mean an increase in working profit by £500 to £1000 per month. Third, we are obtaining an extraction of over 88 per cent. of the original zinc contents of the residues. This shows an increase from about 72 per cent. the first month. We have obtained in systematic experimental work as high as 92 per cent. extraction of the zinc, so that we may make a minor improvement here, although we have not much room for improvement over present results on this line. Still, an additional 4 per cent. re-

[increased profits have already been realized to an important extent.]

The lead extraction from the original residues at present average about 70 per cent. in the Elmore concentrates; but we get out of the mixed concentrates only a part of the lead in them, equal to an actual extraction as final salable lead of only 17 per cent. of the lead in the original material. In experimental work we averaged a recovery of 40 per cent. of the original lead, instead of 17 per cent., as above. We hope eventually to duplicate this in regular operation of the plant. If we do so, the increased profit from the extra lead and the further increased purity of the zinc would, on present tonnage, and at the metal prices I have given, amount to between £2500 and £3000 per month. We have, therefore, a possible increase of the present profit from reduction of expenses of £2500 per month, from increased zinc extraction £500, from increased tonnage £500, and from increased lead extraction £2500—or a total of £6000 per month, or £70,000 per annum, and this without increased price of metals. To do this, or something approaching it, we shall need to lay out £7000 to £8000. To recapitulate, at the present moment we are earning a profit above the cost of the material we treat, and on present low prices of metals, of about £48,000 a year. If we succeed in these technical improvements we shall raise it to over £100,000 per annum. I cannot guarantee that we shall accomplish all this. We have had such results for short periods, and every week since we started has shown some improvement. One thing I can say, and that is, we will accomplish part of it.

A New Vertical Duplex Pump

The Blake and Knowles Steam Pump Works, of New York City, has recently perfected a vertical duplex pump of new design, and small in size, for boiler feed or general work under high pressures. The pump cylinders are of the piston pattern, lined with brass, and the steam cylinders of the company's regular duplex design. The cast-iron cradle or center piece, which ties the steam and water ends together, is extremely rigid. The cylinders are fitted with brackets for bolting the pump to a bulkhead or wall. The pump is suitable for a working pressure as high as 200 lb. per square inch.

When dynamite burns, the chief danger, other than from its liability to explode,

Colliery Notes

When shots are fired by electricity, the button of the battery should not be pressed until a high speed has been obtained in the armature.

In firing shots electrically, many precautions must be observed. The cable, or firing line, should not be allowed to "kink;" it should either be "reeled" and "unreeled," or otherwise carefully coiled. If a "kink" does occur in the firing line, it should not be given a short pull to straighten it out. It should be twisted carefully back again into its straight line; the operator should always remember that much trouble is caused by the wire becoming broken inside the insulation; this is what usually happens when "kinks" are pulled vigorously.

In analyzing the common type of direct-current motor as used today, it is safe to say that the "starter" is a most important part of the controlling apparatus. A good starter should possess the following points: (1) A dead handle or lever so constructed that no current passes through the handle proper. (2) No current should pass through hinged or movable joints. (3) Completely inclosed and fireproof resistances. (4) A frame which cannot become "alive" due to burned out coils. (5) Easy replacement of coils. (6) No soldered connection.

In connecting up the wires, when all shots are fired by electricity, the extremity of the wires should be carefully cleaned by scraping them bright with a knife, laying the extremities across each other, in scissor fashion, and then twisting the free ends over each other a few times. The jointing is very important, for if the connection is made with dirty ends, the external resistance is so increased as to materially affect the firing capacity of the exploding machine. It is also a fact that a clumsily formed joint may be so ineffective as to cause a misfire.

Two English miners have designed a simple invention, with the object of providing greater safety for those riding in the shaft. The scheme is to have two ropes attached to each cage; one of these cables will be the working rope, while alongside of this there will be another rope, slightly longer. If the working rope were to stretch, which would be the case when it approaches the breaking point, then this additional rope would come into operation and take its share of the weight and thus prevent the accident. In case the working rope should break, then the auxiliary rope takes the full weight of the cage and its load. The invention is effective and inexpensive.

Many dangers always attend shaft sinking, and because of the hazardous nature of the work, every possible safety precaution should be observed. In carrying on sinking operations, the foreman should see that all loose stones or suspicious sides are properly timbered or drawn down. This is most important when a shaft is crossing a disturbance, for shafts have been known to collapse after a sharp-angled fault has been crossed. The shots should be fired by electricity, thus minimizing the risk of miss-shots; also they should be fired simultaneously in order to avoid the danger of returning for new connections when firing singly. When approaching a coal seam, it is essential to keep a sharp lookout for firedamp blowers. The engine driver should at all times have full view of the pit.

In the arrangement of "winding signals" from different levels in a shaft, the old system of having a galvanized wire leading from a bell in the engine house and being worked at the different levels by levers, has been almost entirely replaced by the adoption of electrical signaling. In this latter system, a battery of the Leclanche type is suitable, being simple in construction and needing but slight attention. The single-stroke bell is much superior to the trembler bell. The signal wires leading from the bell in the engine house down the shaft, should be properly insulated and be carried down the shaft in grooved boarding; this method is more expensive, but will be found cheaper in the end. The diameter of the insulated wire should be slightly larger than the groove, so that the former can be gently tapped into the groove and covered over by a light boarding. When this plan is followed, there will be no danger of leakage of the current.

It is a matter of great importance to the safety of our miners, that every precaution be exercised when entries or chambers approach old workings. Our mining laws in many States neglect to prescribe rules tending to create greater safety under such circumstances. When an entry is approaching a place likely to contain a dangerous accumulation of water, the heading should not at any point within 100 ft. of that place, exceed 8 ft. in width; it is advisable to further require that at least one bore-hole in the center of the heading should be at least 15 ft. in advance; several flank bore-holes should be drilled on each side. The following signs will sometimes indicate that a heading is approaching a dangerous place: A large number of breaks or cracks are found in the roof, floor and coal; the coal is often discolored to a brown or yellowish hue; an absence of gas in the coal; oozing of water from the strata; lights burn dull, due to the amount of carbonic-acid gas given off from the breaks in the strata.

An investigation of accident statistics, as compiled by the mining departments of several European countries, shows that in recent years, since all explosives have been made to conform to set standards of safety, accidents due to blown-out shots have decreased more than one-half. The question now confronting European coal-mine managers, is concerned with the advisability of using safety lamps exclusively in all underground workings. There are two arguments advanced against the adoption of safety lights: First, the men demand an increase of wages when safety lamps are introduced, and the mine owners raise objection on the score of economy; second, it is contended that the safety lamp does not give so good a light as the naked flame, and that the former, because of its inferor illumination is dangerous to workers because of their inability to see the roof plainly, and thus avoid falls of top and sides. The first objection to the abolition of naked lights is prompted on the part of both miner and operator by their desire for material gain. As to the second argument, the reports of a number of inspectors in districts where safety lamps have been introduced, do not show that the introduction of these lights has increased the number of accidents; on the other hand, the report of one of the inspectors shows that of 184 explosions of firedamp or coal dust, no fewer than 160, or 87 per cent. were attributed to naked lights.

Because coal-mine accidents have left so many widows and children without support, it is being widely suggested that the different States levy a tax on all the coal produced so as to create a relief fund to aid these unfortunates. Among the many schemes proposed, the chief inspector of Pennsylvania has suggested that the State levy a tax of ¾c. per ton on all bituminous coal sent to market or used in the manufacture of coke, and a tax of 1½c. on each ton of anthracite coal sent to market. Anticipating a fair average increase in the production of coal in Pennsylvania during the coming years, this plan would insure the State an annual income of about $1,500,000. Statistics show that on an average, coal-mine accidents in Pennsylvania leave 574 widows and 1316 orphans each year. The Pennsylvania inspector's proposal would insure each widow $100 to defray funeral expenses and a weekly benefit of $2.88 during widowhood; each child under 14 years of age would receive a weekly benefit of $1.92. In addition to furnishing this relief for widows and orphans, approximately $100,000 per annum would be distributed for the succor of disabled miners. The additional cost of production entailed by the adoption of this system would eventually have to be paid by the consumer. The person who consumes ten tons of coal in a year would have an additional expense of about 7½c.; the person who uses 40 tons of coal a year would have an additional expense of 30 cents.

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The U. S. Geological Survey in 1908

The report of work done by the U. S. Geological Survey in 1908, published nearly in full elsewhere in this issue, shows once more the extent to which this organization has abandoned its proper field—the field in which it won its spurs—in order to disport itself in paddocks wherein it has no real business to be. The science of geology and the study of ore deposits are relegated to the background while attention is concentrated upon statistics, water resources, development of water power, mine explosions and rescue work, the testing of building material, etc. Its own statement is good evidence of the commercial spirit that now pervades the Geological Survey.

One reason for this is not hard to find. The results of study of science are generally non-spectacular. To but few is it given to surprise a secret of nature, to discover a new element or disclose a new scientific principle. The work of the multitude of scientists is to add laboriously, brick by brick, to the great structure, generally without any identifying mark that lives. On the other hand, investigation of economic subjects may win immediate applause from the public. Bulletins can be issued to the press, which to more or less extent gives them circulation. The organization is kept constantly before the public eye and so it becomes easier to secure appropriations, which is what the organization wants.

Director Smith means well, but he has not yet been able to shake off the malign influence under which the Survey suffers. At present, his organization has gone mad over what it considers to be economics. The conservation of resources has been hailed as a new idea that promises an expansion of the last appropriation of 1¼ millions of dollars. Learned essays are written about waste that may be prevented, with little or no attention to the economy of doing so. (Such a sober consideration would seldom lead to the spectacular result that is desired in order to gratify the imagination of the public).

What the miners really want is advice and information respecting the discovery of ore. If the Geological Survey will aid in that, the engineering profession will take care of the rest. But apparently this is not what the Survey is now most anxious to do. Let us point out to the Survey that a Leadville report and the discovery of a scientific principle, like that of secondary enrichment, are of vastly more importance to the mining industry than all of the frothy information that has been communicated during recent years.

The European Zinc Convention

The European zinc convention, of which we reported the organization in our issue of Jan. 9, is the consummation of plans that have been under consideration for a year or more. We are unable yet to give the full details of the program, but what we have already reported is sufficient to show that the plan and scope have been devised with unusual ingenuity, in order to avoid the pitfalls that have caused disaster to previous conventions. The fundamental purpose of the new convention is to regulate the price for spelter, which means, of course, to keep the price at a high figure. Such a purpose is unholy and is to be condemned. We suffer in the United States from evils arising from the trusts, but we have not gone so far as the European countries, which permit cartels and conventions that would be illegal here.

The European zinc convention is organized at an opportune time, inasmuch as no immediate danger of importation of spelter from America is to be anticipated there. The cost of producing spelter in this country has risen so much because of the necessity to mine a very low grade of ore in order to supply our domestic consumption that the chances are that our smelters will not be in a position to export spelter for some years to come. Yet, we are disposed to think that the present tendency toward a rising price for spelter will not be permanent. Sooner or later, new discoveries of zinc ore will be made that will restore us to our old position of economic production. Moreover, it is possible that zinc smelting may some day be inaugurated on the Atlantic coast, importing ore from Mexico, South America, Australia, and elsewhere. Such a scheme would be by no means impracticable, and if the European convention maintains a high price for spelter, American financiers may be attracted to go into it.

THE INDEX to volume 86, covering the second half of 1908, is mailed to all subscribers with this issue of the JOURNAL.

The coal industry in the United States has grown with amazing rapidity. Since 1899 when this country wrested the supremacy from the United Kingdom, its coal output has increased so that at present we are producing upward of 200,000,000 tons more each year than the United Kingdom, our nearest competitor. However, an examination of the statistics of coal mining in this country shows that in spite of our successful growth, we have no reason to feel any great elation. In 1908 we produced more than 419,000,000 tons of coal, of which 80,000,000 were anthracite. Each ton of anthracite coal had a value of $2.30, while each ton of bituminous coal was valued at $1.15. Against these values the British coal operators can show that every ton they produce brings them $2.16 at the mine, so that after all is considered, we in the United States cannot flatter ourselves on showing as great a profit per ton mined as our British cousins. Safety is also an important consideration, and when we place a money value on each life lost, it seems that we have small reason for rejoicing at our monster strides in mining coal.

Future Copper Resources

Fears are frequently expressed that the world's resources of copper are not going to be sufficient for the further expansion of the electrical age that is anticipated, and that for this reason higher prices for copper are to be looked for permanently. Good copper mines are indeed hard to find, but among the many worthless properties developed, some good ones are found nearly every year, and the experience up to date shows that these have been sufficient to maintain the required production at an average price not very different from what copper fetches at present. The resources of the world still being so far from measured why should not this condition be expected to continue? We are now beginning to realize large amounts of copper from the porphyry ore of Bingham and Ely, which only a few years ago were not thought of as possible sources of production. In 1908 an immense new deposit of this kind of ore was blocked out in the Miami in America. This mine showed nothing but iron stains on the surface. The experience at Mt. Morgan in Queensland, and at Ely, Nev., and Globe, teaches that certain occurrences making no surface showing of attraction to the prospector of old may be underlaid by immense deposits of this kind of copper ore. This is an important geological discovery, leading to the belief that there are important copper resources, hidden from the eye, which may be found by the application of modern science.

The British Iron Trade

While full returns are not yet available, the signs of depression in the British iron trade in 1908 are not wanting. The return made by the Scottish Association—usually regarded as a close guide to the general production of iron—shows a reduction of more than 12 per cent. in the make of iron, while the stocks on hand increased by 90,000 tons; the actual sales for consumption having decreased by nearly 20 per cent. This indicates a nearly parallel reduction throughout the United Kingdom. It is true that this decrease is much less, both actually and proportionally, than that in our own iron production; but fluctuations in the British iron trade are never so sharp nor so quick as in our own, and a loss of 10 or 15 per cent. is a very serious change.

Another indication is found in the export trade, which last year was less than in 1907 by nearly 11 per cent. The British exports form a larger proportion of the total trade than in this country, and such a loss implies an important reduction in activity. Moreover the loss was especially marked in finished materials, which constitute the more important and profitable part of the trade.

Prices of crude iron are also low. The latest advices show Middleton pig selling below $12 per ton, and Scotch hematite, corresponding to our bessemer pig, under $14. Tin-plate bars are quoted about $21, with billets at a corresponding price. Moreover light demand and small sales are reported in all the market. Evidently the British iron masters do not open the year in much better condition than our own.

The explosions at the Lick Branch mine, Ennis, W. Va., Dec. 29 and Jan. 12, whereby 51 and 65 men were killed, and at the Leiter mine, Ziegler, Ill., Jan. 10, whereby 25 men were killed, occurring at this noteworthy period of earth disturbance, direct attention once more to the frequent close correspondence between these phenomena. Perhaps the most singular phase is that the correspondence is not local, but often occurs in widely distant parts of the globe. The earthquake in Italy was preceded by seismic disturbances in Montana, beginning Dec. 21 and continuing to Dec. 27. On Dec. 23 there were gas explosions in mines in Colorado. In November last the Marianna explosion was preceded by a few hours only by severe earthquake shocks in Boston. The Maypole disaster in England, Aug. 18, was likewise preceded by a few hours only by severe earthquake shocks at Eureka, Cal. It will be acknowledged by any candid mind that while a dangerous condition may exist in mines following seismic disturbances, local or otherwise, a mine explosion does not necessarily follow, since the ignition of the gas is necessary to produce an explosion. Also the ignition of gas in well regulated mines does not in most cases result in a mine explosion. However, it is obvious that, if there be any real connection between seismic disturbances and release of gas, a time like the present is one that should cause operators to be particularly on guard.

FURTHER PROGRESS in the use of mine timber, chemically treated in order to prevent decay, is being made. An anthracite coal-mining company of Pennsylvania was the first to introduce this practice. Its lead is being followed by the Miami Copper Company, of Globe, Ariz., and by two lead-mining companies of the Cœur d'Alene. It has been aptly pointed out that if it be economical to preserve railway ties, which are not only cheap in first cost, but also are cheap to replace, it will be far more economical to treat mine timber which is dear in first cost and also in the labor expense for renewal.

STATEMENTS AS TO the amount of copper in stock in this country, that have been much discussed this week, are undoubtedly far in excess of the actual condition.

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Testing Placer Ground

A good deal has appeared in the columns of the JOURNAL and elsewhere lately, regarding the testing of placer ground for dredging purposes by hand or steam drills, and I have personally spent a good many thousand dollars in this same manner for people who were anxious to obtain such ground. These articles have covered the subject in an exhaustive way and have been most excellent, so far as they go, but it seems to me a few words more might be added which would tend to make dredging examinations far less costly affairs in the aggregate.

We all know that placer ground suitable for dredging purposes is one of the most difficult things in the world to find; it is almost as scarce as are hen's teeth. At the same time, there undoubtedly is much unexplored territory in the world today, which would pay to prospect for this purpose, provided there is a reasonable chance of finding it worth the effort and not an absolute waste of money. My own experience in this line has led me to offer a few suggestions to the mining fraternity, as well as to the intending investor.

EXPENSE OF DRILLING

To drill a piece of ground of any size, and at all thoroughly, is very apt to entail an expense of from $5000 to $10,000; and if such work is done in the tropics of South America, or in other foreign countries, it may amount to very much more than that. Often the ground is proved to be entirely unsuitable for dredging purposes, and this money is practically thrown away on a worthless proposition, with the result that the investor feels disgusted. Such properties are occasionally brought to the attention of capitalists by men who are themselves satisfied that the ground carries sufficient gold and is otherwise suitable for this purpose, before the area has been drilled at all. These men have usually arrived at their conclusions honestly, by panning the surface in a casual manner, or by actually seeing some natives or local miners sluicing out "stakes" upon various parts of the property. I do not mean that dredging ground is always presented in this way, because sometimes it has already been partly drilled, but in that case the owners themselves or someone else has had to take this gamble in the beginning. It then resolves itself into a question of whether they have done the work correctly or not, which I do not wish to touch upon here.

I have seen properties in South America, which were known to contain placer gold tested in a most superficial manner by desultory panning of the surface. With this information alone a company has been formed and an expensive dredge installed to work the ground, with most shocking results to everyone concerned. Of course, the ground should have been properly drilled in the first place; but the owners argued that their panning results apparently warranted them in going ahead without such a heavy expense as thorough drilling entailed. I am not trying to defend this argument for a moment, but I do think there is a method which might have been followed and which would probably have shown that the ground was either entirely unfit for dredging, or that it would warrant the expense of drilling.

TESTING BY PITS

In most placer ground the water level is found several feet below the surface, and sometimes it is possible to sink pits to bedrock with the aid of buckets or small pumps to keep the water out. But even if it is not possible to sink all the way down, a trained and expert panman in this class of work, which a placer engineer should be, can flag the ground at suitable distances, and, by squaring up small pits at these points, pan the material for each foot in depth separately. By taking a sufficient number of pans from each foot and uniting the gold so found for weighing, he can obtain a surprisingly close approximation of what the ground is worth to the depth he is able to sink conveniently. His experience in other fields will often tell him what to expect below the water level, where he cannot get.

Of course, this method of making a preliminary examination is perfectly obvious to every engineer, but to many promoters and investors it is not, and they might be slow to think that a property, turned down by a man using this method had been given a fair chance. That primarily depends upon the man who does the work. Unless he is a trained engineer deductions of this sort may be well founded; for the average promoter or investor, who undertakes to do this himself, be he ever so honest, is not apt to be cold-blooded, exact, or methodical in his work, leaving aside altogether the question of experience and lifelong training.

The expense of such a preliminary examination is trifling as compared with that of drilling the ground, and it may only show that the ground should be drilled anyway. A large piece of dredging ground can stand this extra cost; and if it is unsuitable for the purpose, the heavy expense of an examination by any kind of a drill has been saved. The total equipment necessary is a small pair of scales, costing about $15, some acid and mercury, test tubes, annealing cups, an alcohol lamp, and a pan, together with the necessary digging tools which can be obtained anywhere. The engineer does all the work himself, with perhaps one or two ordinary laborers as helpers.

A. P. ROGERS.

New York, Dec. 17, 1908.

Alumina in Copper Blast Furnace Slags

In recent issues of the JOURNAL I have noted Charles F. Shelby's quotations of Carl Henrich's articles relating his experience in New Zealand at the Champion mines in May, 1886, also Harley E. Hooper's criticism of Mr. Henrich's results in the issue of Dec. 5 and Mr. Shelby's reply in the JOURNAL of Dec. 26, 1908.

When Mr. Henrich's articles appeared in the JOURNAL of July 17 and Aug. 28, 1886, I fastened to them as containing the only practical information on the subject "Is Alumina an Acid or a Base?" at which everyone was having a whack about that time. I have carefully kept them ever since. I afterward gained some first-hand information concerning this work, which may prove interesting now. My own connection with the matter was through samples of ore sent to the Mt. Lyell works for treatment and for advice, and also afterward from negotiations in regard to my taking up the work provided a new company could be formed.

In conversation with the only surviving director of the old company, who came to the Mt. Lyell works to see the ore sampled, I mentioned the existence of those articles. He was greatly surprised, and when I showed them to him he remarked: "Why, we only ran twice, about three or four days altogether, when the bank shut us up." This, with the following facts, shattered my faith in the articles in question.

The total amount of ore smelted was small; Mr. Hooper says the whole dump contained about 100 tons. Mr. Henrich's

report to the company starts off, "There have been smelted during the last run a total of 119,416 lb. copper ore——," about 60 tons. The furnace was a 30-ton round copper furnace built by Fraser & Chalmers, of Chicago.

With the ore samples sent, which, by the way, contained 4.51 per cent. alumina, there was a sample of the old slag and one of the old matte. The old slag sample, which showed pieces of free matte scattered through it, gave the following result: Silica, 30 per cent.; iron, 37.9; lime, 9.5; magnesia, 12.42; alumina, 5.67; and copper, 1.22 per cent. This confirms Mr. Hooper's analysis.

Mr. Hooper's statement that practically no lime was given is not quite correct. In his samples Nos. 1 to 4, 1.5 per cent. is the highest lime given, but in samples Nos. 5 to 9, the lowest is 5.1 per cent., and the highest 15 per cent., with an average of 9 per cent.

I think with Mr. Hooper that the deductions of Mr. Henrich in this particular case are based on insufficient and inaccurate data and are, therefore, misleading. Mr. Henrich's difficulties were great; his isolation complete so far as men and material were concerned; pure chemicals were almost impossible to get, and his chances for accurate work were reduced to a minimum in many ways. Twenty-two years ago rule-o'-thumb and cut-and-try were still helpful methods with a lot of us. Mr Henrich's work, however, represented advanced thought and was very acceptable.

G. F. Beardsley.

Fruit Vale, Cal., Jan. 4, 1909.

Discipline in Mines

The question of discipline in the management of mines will be of much greater importance in the future than has ever been attempted in the past. In my opinion it will be a vital factor in the safer operation of dangerous mines.

The fact that rigid discipline is maintained in European collieries is one of the open secrets of their steadily decreasing death rate from mine accidents. Yet despite this, the continental mines labor under more dangerous natural conditions than we have; their workings are deeper and more gaseous. For instance, England, France, Belgium, Nova Scotia and British Columbia mine coal in gaseous seams, on a scale as extensive as our own, and under conditions where they are surrounded with the maximum of danger; however, their statistics show a gradually decreasing percentage in the death rate; ours a shocking increase. This, more than any other argument, says something radically is wrong with our methods or management, or both.

We have often criticized our British cousins for their methodical ways, but the writer is under the impression that it would be greatly to the general good of all concerned if we adopted a little more method and system in our work. We are altogether too restless, too experimental in our mining as in many other things. The child is ever unmindful to profit by the pitfalls encountered and overcome by the parent.

Result of Foreign Experts' Visit

Not long ago the reader will recall the visitation of a committee of foreign mine experts, come hither at the solicitation of our Government, to look into mining conditions here with a view to offering suggestions for betterment. Their report was anything but startling. They told us but little we did not already know. The bulk of the commission's report is already embodied in many of our State mining laws. Some things they advised we do not at all approve. They suggested 650 volts of electricity as the limit in mines using that power, yet many of us have found to our regret that 250 volts is high enough considering the fatalities which have occurred from this source when men have come in contact with it. Taken as a whole, the commission simply told us that which we already knew, and left it to us to either change, or continue, as we saw fit, anything which in our system was contrary to their finding; this confirms our opinion that it is up to us to adopt a system based on the best mining knowledge, and experience with actualities, and then strictly adhere to it.

The Laws Must Be Enforced

Rigid discipline will be one of the chief essentials in the new methods which will undoubtedly be adopted. In the first place it will be necessary to have every employer and employee fear the law, insofar as violating it is concerned. It must be made financially easier for the employer, and less painful for the employee to obey the law than to ignore it. Employers of men must be taught by the sternest measures, that they must not expect an employee to be fire-boss and shot-firer, where one duty is enough to take all his time, and run chances of what may happen because of his inability to complete his contract. Employees must be taught in turn that they will have—even assuming no explosion follows their act—more time for their own pleasure if they get tamping clay by a little trouble, rather than use the more readily procured coal dust. Trivial things both, but what of the result? It does not seem so trivial according to Inspector Loutitt's testimony at a recent inquest.

Punishment Should Be Severe

I can speak from personal experience when I say emphatically that the law is misconstrued purposely every day in many of our most gaseous mines, and even boldly violated without fear of punishment. I have also found that the average miner has no fear, and seldom even respects the law as it relates to mining. This is a matter of vital importance to the safe working of our mines. Compare such a condition with the feeling that exists in other mining countries, England, for instance, where if a man leaves a ventilating door open, it means three months at hard labor without the option of a fine. And he gets it! Justice is meted out quickly and hard, whereas in this country the case would probably hang fire three months before being taken up by the court. I have spent a week of valuable time, with my work at the mine going by default, endeavoring to bring a case to argument where a miner had deliberately disobeyed the law. It is an experience which makes any mine official hesitate about enforcing the legal provisions governing his operation.

If we are to profit by any law, present or future, it must be enforced quickly, positively, and in such a way as will create a lasting impression; when this is done, mine managers will deem our laws a help, rather than a hindrance.

Sim Reynolds,
Superintendent Raven Coal Company,
Wheeling, W. Va.

January 6, 1909.

Speed of Hoisting at British Collieries

The speed of hoisting in British collieries is, according to an editorial note in the *South African Mining Journal*, Aug. 8, 1908, at the Dowlais Cardiff, 2220 ft. in 52 sec., an average winding speed of 2562 ft. per min.; Ashton Moss, 2850 ft. in 1 min. 25 sec., or 2010 ft. per min.; Lady Windsor, 1500 ft. in 35 sec., or 2571 ft. per min.; Bolsover, 1116 ft. in 28 sec., or 2388 ft. per min.; Denaby and Cadeby, 2289 ft. in 55 sec., or 2497 ft. per min.; Rhodes Rotherham, 1650 ft. in 45 min., or 2358 ft. per min.; while at the Rosebridge mine a maximum hoisting speed of 5100 ft. per min. has been recorded; but this is excessive, as, for considerations, of safety, it should not exceed 4000 ft. per min. From the foregoing data, and taking into consideration the needs of a regular output, an average hoisting speed of 3000 ft. per min. may be assumed to represent the best modern practice.

In timbered drifts the track should not be spiked directly to the sill timbers of the sets, as then it is difficult to lower the track if that becomes necessary in order to level it.

In mine tracks fish plates should always be used to join the rails, and the ends on both sides of the joint should be securely spiked.

Loading Blast Holes and Driving Small Drifts

By George C. McFarlane*

Contributors to recent issues of the Journal appear to hold widely divergent views as to the proper method of loading up the drill holes. As to the proper place for the detonating cap, I am certain that Mr. Adkinson is correct in stating that a hole shows more shattering in the vicinity of the detonating cap; this is no reason, however, for placing the cap in the bottom of the hole.

As everyone knows, dynamite is detonated from a solid into a gas by pressure. When the detonating cap lets go it compresses about 2 cu.in. of the surrounding mass of dynamite sufficiently to cause dissociation; the transition from solid to gas must occupy a definite interval of time, about one-twenty thousandth of a second. The initial explosion of one or two cubic inches of dynamite in the immediate vicinity of the cap would generate sufficient force to compress the entire charge to the dissociating pressure.

Detonation of a mass of black powder is effected by a uniformly expanding zone of flame starting from a spark. With dynamite detonation is accomplished with a succession of jolts separated by imperceptible but definite intervals of time. This explains why a strong cap and a well packed charge give definitely better results. The strong cap detonates enough of the surrounding charge to make a strong primary explosion. When the charge is well tamped the primary explosion would compress two or three feet of powder to the pressure of dissociation. With a weak cap and poorly compacted dynamite, it is conceivable that it might take three or four jolts to explode the whole charge.

The reason the ground around the primer is badly shattered is that the primary explosion of an ounce or so of dynamite hasn't power enough to spring the rock burdened on the hole, and as the tamping is tightly up against the explosive, the pressure crushes and shatters. In the interval that precedes the detonation of the main portion of the charge the gas from the primary explosion blows the tamping back an inch or so and cushions the main explosion to a certain extent. For these reasons I believe a cap should be in the top of a charge, because it is evident that the main or secondary explosion tears the rock out. With a cap on top a small part of the upper end of the charge is rendered useless for rock breaking purposes; with the cap in the bottom a small part of the bottom of the charge is consumed in shattering the bottom of the hole. With a lifter or back hole it wouldn't make a particle of difference, as far as breaking ground went, where the cap was; with a cut hole, where the power is needed on the toe of the hole, a cap on top of the charge will tend to put the locus of the principal concussion a fraction of an inch nearer the bottom of the hole.

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Tamping

In breaking rocks with mud-caps, I find it makes a very material difference whether or not the detonating cap is placed on top of the dynamite. The most effective way to break a rock is to pick out a little depression and form a wall around it with plastic clay; fill this crater with dynamite, lay the cap on the center and cover the whole with soft clay. If the cap is shoved down into the dynamite the breaking power of the mud cap is lessened. The only possible explanation of this phenomenon is that when the detonator is near the bottom of the dynamite, the detonation lifts a portion of the explosive bodily from the rock before it bursts into gas. High explosives must have a good contact with rock which it is desired to break. When a mud cap is placed on top of a stone, the explosive is usually plastered down tight against it, and the stone is broken into several fragments; if the same quantity of explosive were poked under the stone it would have poor contact and do very little execution. This is the reason why dynamite is supposed to strike down.

In regard to tamping a hole, I think that ordinarily 8 or 10 in. of clay tamping is enough. Strong cut holes require more tamping to get the full power of the explosive. Take the case of a 6-ft. incut hole in the face of a drift, the hole being 1¾ in. in diameter and loaded with 32 in. of 60-per cent. explosive. The center of the charge would be burdened 4 ft. and in hard granite or trap it would take one two-thousandth of a second for the concussion to travel from the explosion to the free face. This means that for a period of one two-thousandth of a second the gases of the explosion must be confined. At the end of the period, the momentum imparted to the rock tears it away from the solid. During this period the tamping will be subjected to a pressure of 450,000 lb., sufficient to force 18 in. of clay or 3 ft. of water tamping 6 in. This shows that 18 in. of clay tamping is none too much. A 6-ft. hole burdened 30 in. would kick 8 in. of clay tamping back 6 in. before the rock cleaved from the solid.

A quick way to tamp up a round of holes is to have one of the muckers make a candle box full of clay slugs 1½ in. in diameter and 4 or 5 in. long. In loading twist a piece of paper around one end of the slug and they are easily shoved in and rammed home with the loading stick. I think the best results are obtained by putting in 18 in. of tamping for the incut holes and 14 in. for the other holes. Using a 2-in. time interval on the fuses, the fire in the fuse will be several inches in the tamping before an adjacent hole goes off. It is no uncommon thing for a hole to kick off 2 or 3 ft. of another hole; as long as the fuse was burned down into the tamping and firmly bedded in a foot or so of clay, the spent fuse would break in case a collar blew off; otherwise the fuse might be pulled out of the hole. I noted a case in which one hole cut another hole off in the middle of the powder charge; the hole had pulled back to a slip and the dynamite was cut so smoothly that there was no sign of a hole on the slip until one of the men stuck his pick into it.

This cutting off of holes is a prolific source of accident. If the holes are overloaded as they often are, powder is thrown in the muck. Of course, there is no method of blasting that will eliminate accidents altogether, because things are liable to happen in blasting a round of holes that no man can foresee.

Drifting and Crosscutting

In driving drifts and crosscuts where there are no good slips or floors to break to, the "V" or pyramid incut will be found to be the most satisfactory. In narrow drifts four holes will be enough and they should be drilled so that the points nearly or quite intersect. In drifting, I think the double-screw column is much handier than a cross-bar, although it takes longer to rig up on a column than it does on a bar. In uneven ground, the machine often runs up or down on a hole; with a column and arm it is possible quickly to adjust the machine for alinement and often prevent the steel from fitchering and running tight. In very tight, hard ground, it pays to set the column as close to the face as the machine will work; drill the holes about 5½ ft., and give them as much lift as possible. Of course, when the cut holes are drilled with the machine close in, the column has to be rigged back about 18 in. to drill the back holes and lifters.

If the ground is only moderately hard it pays to drill the cut holes so as to bottom 1¾ in.; then four pounds of 60- or 75-per cent. dynamite can be put in the bottom 30 in. of each hole. If the ground is extremely hard, time can be made by drilling the holes smaller, bottoming them 1¼ or 1⅜ in. Not only do small steels cut faster and hold their gage better, but it is also far easier to collar a hole on a slanting face with a small starter.

When small holes are used it will be necessary to spring the four cut holes with about four 1¼-in. sticks of 60-per cent., then blow them out well with a blowpipe; this will chamber the holes so that they will take enough powder to throw out the incut. It takes about 40 min. to spring four holes, (15 min. to tamp up, 15 min. to get the smoke out of the drift, and 10 min. with the blowpipe to clean and cool the holes.)

Order of Fire and Misfires

In most cases it is a decided advantage to blast the incut with a battery, although it takes more time than if the holes are

all loaded and fired in one round. When fired with a battery the cut generally kicks the collars off a few of the surrounding holes, so that after the incut round there isn't the same danger of holes cutting one another off and causing misfires and scattering powder in the muck. Again if the cut does not come out well the bottoms can be reloaded and spit with the squaring holes. When the incut is blasted separately, there isn't much danger of the machinemen lighting holes out of their proper order and perhaps spoiling the whole round.

If a hole that is solidly tamped with about a foot or so of clay tamping misses fire, it is certainly no joke to dig the tamping out. If the caps are always soaped, and waterproof fuse is used, such mishaps are bound to be extremely rare. One method of drawing tamping that is a little safer than picking it out with a scraper, is to burn it out by repeatedly loading up whatever collar there is to the hole; after two or three shots the concussion will jar through the tamping and set off the main charge. Another method, which I believe is safer, is to make a little tank by capping both ends of a 6- or 8-in. pipe about 3 ft. long, tapping in a couple of inch nipples on opposite sides of the pipe. This tank would hold two or three pails of water. To blow tamping use a small tip on the blowpipe, wedge a plank or board across the drift, and after inserting the blowpipe in the hole, lash it fast to the board so that it cannot kick back. Now run the blowpipe hose to the water tank and run the machine hose from the air pipe to the upper nipple of the tank. Use a valve two or three hundred feet back from the face for turning on the air pressure. This method works well in an upper or flat hole; it will often wash out a foot of tamping without shifting the blowpipe.

Indiana Mine Legislation

SPECIAL CORRESPONDENCE

The indications point to considerable legislation relating to mines and miners in Indiana during the present session. At first opportunity, three bills were introduced. Senator Bland presented a bill to regulate the width of entrances to coal mines. Senator Royse introduced a bill which provides for the careful supervision of men who work in the coal mines of the State. This measure provides for the creation of a miners' examining board in each county where mining is carried on. Said board is to consist of three members appointed by the circuit judges of the different counties who shall hold examinations monthly, keep a record of the mining certificates issued and make stated reports to the circuit judges, and to the mines inspectors of their respective districts. No man will be entitled to work in the mines, who has not had two years' experience in such work, and all who have been in the work two years will be entitled to certificates without examination.

There is nothing in the bill which will prevent men from working under the direction of skilled miners in order that they may learn the business. The measure calls for a fine of from $100 to $500, or a sentence in the county jail from 30 days to six months for violation of any of the provisions of the act.

Coal Miners' Convention

SPECIAL CORRESPONDENCE

A large number of the 1100 delegates due to attend the International Convention of the Mine Workers of America, in Indianapolis, Indiana, beginning Jan. 19, were on hand the day before the convention opened. Already there are hints among the delegates and at headquarters of exciting times ahead, and even President Lewis intimates that he will not be at all surprised if the convention is the stormiest ever held.

Much interest centers in the outcome of the election for president, and a few anti-Lewis men are saying that, in the event Lewis carries the day, several districts are almost certain to secede.

The friends of President Lewis contend with some show of reason that he has not had a "fair shake," and assert openly that a systematic effort has been made to cripple his administration. They point to the fact that he succeeded in reviving the joint conference after it had become, to all intents and purposes, dead; that he secured a two-year wage scale during a panic, which continued in force the "prosperity" scale of wages for 285,000 mine workers, a thing unprecedented in the history of joint conferences; that in reviving the joint conference he practically saved the organization from dissolution, as all well-informed union men assert, that without the presence of the employers at a convention there is no one to negotiate with.

On the other hand his opponents say he has lost every strike and abandoned districts in trouble until several vice-presidents have refused to longer serve as national officers.

To those who stood at the cradle of the organization and risked much to make it the most powerful trades union in the world, the situation is particularly distressing. They are hopeful some course will be pursued that will avert the threatened rupture, for they say it is idle to deny that the organization now faces the most critical period in its history; that it is divided into factions which are arrayed against one another with undisguised hostility.

The anthracite situation does not present a roseate appearance, from the organization's point of view. The fact is the union is in a moribund condition with a pitiful sum in the three district treasuries, compared to what should be there to meet what will be a most serious situation in April, when the three-year contract will expire by limitation. The outlook, therefore, for a successful struggle with the anthracite operators does not seem particularly hopeful to even the most sanguine.

Other matters known to be antagonistic to the Lewis administration are to come up, which will tax the conservative members heavily to prevent continued dissention and strife during the convention.

Mining Legislation at Washington

SPECIAL CORRESPONDENCE

The bill for the relief of applicants for mineral surveys (H. R., 25,396) introduced on Jan. 8 by Representative J. C. Needham and referred to the House Committee on Mines and Mining was favorably reported on Jan. 14. A few amendments were incorporated and the measure now reads as follows:

"That the Secretary of the Treasury be, and he is hereby, authorized and directed to pay, out of the moneys *heretofore or hereafter* covered into the Treasury from deposits made by individuals to cover cost of work performed and to be performed in the offices of the United States surveyors-general in connection with the survey of mineral lands, any excess in the amount deposited over and above the actual cost of the work performed, including all expenses incident thereto for which the deposits were severally made *or the whole of any unused deposit; and such sums, as the several cases may be, shall be deemed to be annually and permanently appropriated for that purpose.* Such repayments shall be made to the person or persons who made the several deposits, or to his or their legal representatives, after the completion or abandonment of the work for which the deposits were made, and upon an account certified by the surveyor-general of the district in which the mineral land surveyed or sought to be surveyed is situated and approved by the Commissioner of the General Land Office."

The amendments are of importance because they make the bill apply for the future as well as to past transactions, while the appropriation is made annual and permanent with this purpose in view. The changes were introduced in consequence of a letter from First Assistant Secretary of the Interior Frank Pierce to Mr. Needham, in which Mr. Pierce pointed out that the proposed legislation was urgently needed, as the sums which

accumulate in consequence of these deposits are neither funds of and available to the United States, nor, under present conditions, repayable to those rightfully entitled to them. He went on to note that the Comptroller of the Treasury disagreed with the conclusion reached by the department (36 Land Dec., 561) in a case of an application for such repayment, upon the ground that while Section 2402, Revised Statutes, directs repayment of "any excess in such sums over and above the actual cost of the surveys," it does not in terms appropriate them to that purpose, which appears to be a strict rule of interpretation in his office. The effect of the bill as now drafted will be to bring about the regular repayment of unusued deposits and the excess of deposits made by individuals to cover the cost of work in the offices of surveyors-general and covered into the Treasury in connection with mineral surveys.

Tariff Hearings at Washington

SPECIAL CORRESPONDENCE

It has become apparent within the past few days that the Ways and Means Committee is making a serious study of the question of duties on iron ore, and is inclining to the idea of removing them entirely, or at least making a large cut in the present rates. Chairman Payne has carried on considerable correspondence with reference to the metallic content of various ores and has written to some of the producers to ask the character and fine content of their product. In addition he has written to the Geological Survey asking for a tabulated statement showing the content of a number of domestic and foreign ores. This has been furnished him, the answer giving, including Lake, Alabama, Cuban, Spanish and Newfoundland ores. Chairman Payne has particularly written to some of the iron-ore interests who appeared before the committee some time ago in order to get their views. A poll of the Republican members of the committee has shown that they are nearly evenly divided on the subject of removing the tariff on iron ores and that evidence one way or the other that would suffice to turn a single vote might alter the whole outcome on this topic and with it change the general range of duties which will be assessed upon iron and steel products. Among the marked developments in this connection during the past few days has been the definite alinement of the Pacific Coast interests both northern and southern in favor of the total removal of the duty on pig iron, iron ore and coke, strong demands being filed with the committee from Pacific Coast sources, including the United Metal Trades Association of Portland and the Founders' and Employers' Association of Los Angeles. Severe pressure from New England consumers of scrap iron has also developed a request that the tariff be removed, or else cut to not over $1 in place of the present rate of $4 per ton.

ZINC ORE

Along with the iron-ore question the Ways and Means Committee is seriously considering the tariff treatment of zinc ore. The question of duties on the ore is among the most hotly contested that has yet been presented to the committee, and a large number of briefs has been filed on both sides of the question. The opposition to the proposed duties has become exceptionally strong within the past 10 days and is being voiced both by consumers and the smelting interests.

The position of the smelting industry is that there is a constantly increasing shortage of the raw material, and if domestic consumption of spelter is to increase in the same ratio the next 10 years as it has in the past 10, the whole industry will be confronted with a disastrous condition if deprived of foreign ores. Instead of these ores coming to the United States under a duty, it is alleged that they would go to foreign countries, and the users of spelter would be compelled to supply a part of their requirements with the foreign article. It is argued that the domestic production of zinc has increased within the last 10 years 100 per cent., whereas the Joplin district has only been able to increase its output a scant 10 per cent. during this time. The zinc-smelting industry is said to be facing a shortage of raw material, even with the ores of Mexico and British Columbia. Some interests urge that it would be better to reduce duties on spelter than see a duty placed on raw material, and 1c. a pound on finished spelter is said by them to be ample to give the American miner and smelter all the protection they are entitled to. It is pointed out that the difference in the average price in London and the average price in New York during the past 10 years has been less than 0.75c. a pound.

The Cape Copper Company

SPECIAL CORRESPONDENCE

The Cape Copper Company, Ltd., has issued a report for the year ended Aug. 31, 1908. The net profit amounted to £144,366, which is a long way below that earned in the previous year. This large decrease is principally to be attributed to the lower prices that have ruled for copper during the year under review. The decrease in profit has reduced the dividend on the ordinary shares from 19s. per share in 1907 to 6s 6d. per share in 1908. The company dates from 1888 and is a reconstruction of the Cape Copper Mining Company, Ltd., registered in 1863, which paid dividends amounting to £1,324,375 between 1864 and 1888, or £67 13s. 9d. per original £10 share, on which £8 per share were paid. The present company has distributed between 1889 and 1908 £2,666,250 to the ordinary shareholders and £336,150 to the preference shareholders. The operations of the company are not confined to South Africa; it is also interested in the Tilt Cove Copper Company in Newfoundland, as well as in copper mines in India and America. In the two latter countries, however, the operations are of an experimental character.

In South Africa the principal mines are the O'okiep and Nababeep mines, the output from which has been practically the same as that returned in the preceding year. From the O'okiep mine 14,812 dry tons of 15.02 per cent. copper were mined, while from the Nababeep mine the output was 54,974 dry tons of 4.78 per cent. copper. The reserves of ore at the O'okiep mine are estimated at 10,000 tons of 20 per cent. copper ore and at Nababeep 150,000 tons of 5 per cent. ore. From the Nababeep North mine 5069 tons of 5.83 per cent. copper contents were mined. The company owns smelting works both in the Cape Colony and at Britonferry, in England.

At the O'okiep smelting works 25,586 tons of ore were treated, the matte produced averaging 51.2 per cent. copper. At the Nababeep works 51,872 tons were smelted, the matte obtained averaging 49.7 per cent. copper. No details are given in the report about the operations at the smelting works at Britonferry, the only information given being that results have been satisfactory, and that further improvements to the plant have been carried out during the year.

In Newfoundland the Tilt Cove establishment made a profit for the year ending Dec. 31, 1907 of £51,034, one-half of which was paid to the Tilt Cove Copper Company and the other half was credited to the profit and loss account of the Cape Copper Company. The output from the East mine was 27,062 tons of 3.3-per cent. copper, wet assay. The South Lode returned 12,961 tons of 3.53-per cent. copper. The ore reserves at the East mine and the South Lode are given as 45,756 tons.

The director's report is supplemented by several detailed departmental reports.

As regards the South African interests there are no less than 11 separate reports, namely those of the superintendent, the chief mine agent, the mines mechanical engineer, the railway engineer, the traffic manager, the smelting works manager, the port and shipping manager, of two medical officers and of two chaplains. These reports are eloquent of good organization and show that the company pays attention to the well-being of its employees.

Personals

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. E. Spurr is at Matehuala, San Luis Potosi, Mexico.

J. M. Callow, of Salt Lake City, Utah, has been at Ely, Nevada.

H. W. Turner, of San Francisco, is engaged on professional work at Jean, Nevada.

Charles W. McPherson, inspector of surveys in the Canadian Yukon, is on his way to Scotland.

A. Kunkle has been appointed superintendent of the Iowa-Tiger mines, near Silverton, Colorado.

R. Alvin Weiss, of New York, mining engineer, has been called to Montana on professional business.

We shall be obliged if H. B. Pulsifer, formerly of Kansas City, Mo., will advise us as to his present address.

Joseph Jacobson, manager of the Columbus Consolidated mines, Utah, has been a visitor at Houghton, Michigan.

M. M. Johnson, of Salt Lake City, engineer for the Newhouse interests, has been examining claims at Seven Troughs, Nevada.

H. F. Seymour, of Cleveland, O., has taken charge of the Great Southern Mica Company, with headquarters at Asheville, North Carolina.

Dr. Henry Froehling, of Richmond, Va., has been examining the Catawba gold mine, near Kings Mountain, N. C., for Richmond buyers.

Duncan McVichie, of Salt Lake City, recently examined the Prince Consolidated and Ohio-Kentucky mines at Pioche, Nev. He went from there to Tonopah.

Mark B. Kerr, of San Francisco, has been appointed consulting engineer for the Pittsburg-Gold Flat Mines Company in the Grass Valley district, Nevada county, California.

Elton W. Walker has resigned his position as superintendent of the Tombstone Consolidated Mines Company in Arizona, to take effect Feb. 1, and will open an office in Detroit, Mich., as consulting engineer.

The firm of Harvey & Wilbraham, consulting mining engineers, London, England, has been formed by F. O. Harvey, of London, and A. G. B. Wilbraham, late manager of the mining department of Mason & Barry, Ltd., in Portugal.

Edward H. Taylor, Harry W. Weeks, W. D. Stuckenberg and B. G. Maynes have established an office as consulting fuel engineers and chemists, in the Old Colony building, Chicago. The business will be conducted under the name of the Commercial Testing and Engineering Company.

Charles F. Huber has been appointed vice-president and general manager of the Lehigh & Wilkes-Barre Coal Company, with office at Wilkes-Barre, Penn. He has been with the company for 21 years, acting successively as division engineer at Audenried, as chief mining engineer and as general superintendent.

Last winter J. B. Tyrrell, of Toronto, Ont., offered a prize of $100 for the best collection of minerals to be made in the Province of Ontario during the summer of 1908. Professor Nicol, of Kingston, and Professor Walker, of Toronto, examined the collections and awarded the prize to W. F. Batfersby, a third-year student in the School of Mines, Kingston, Ont., who collected most of his minerals in the Montreal River district in Ontario.

Obituary

B. Franklin Jones, superintendent of the Westmoreland Coal Company in Pennsylvania, died Jan. 15, at Atlantic City, N. J., where he had gone for his health. He was 45 years old. He was formerly with the H. C. Frick Coke Company, rising to the position of division superintendent at Uniontown. In 1903 he left that place to take charge of the Westmoreland Company's mines. He was an active member and president of the Coal Mining Institute of America.

Alexander McDonald, a pioneer of the Yukon, died suddenly of heart failure at Celar Creek, Yukon Territory, on Jan. 6, at the age of 52 years. Mr. McDonald was a native of Nova Scotia and reached Dawson in 1896, taking up claims in the Klondike. He speedily amassed a fortune estimated at $5,000,000. He was considered the richest man in the Territory and was also heavily interested in Alberta coal lands. The body was taken to Vancouver for interment.

Alexander Thomas, secretary of the Crucible Steel Company, of America, died Jan. 8, aged 59 years, at Hamburg, Germany. He went to Germany last August in the interest of the company. For more than 30 years Mr. Thomas was identified with the crucible steel industry, having been connected with the Park Steel Company prior to its amalgamation with the Crucible Steel Company of America. Two years ago he visited Japan and did much to introduce American steel in the Orient.

Almarin B. Paul, one of the oldest pioneer miners of California, died in San Francisco on Jan. 12 at the ripe age of 85 years. Mr. Paul had been in active mining ever since he arrived in California in 1849. He built the first quartz mill in the State and was also one of the first to take up the cyanide process on the Pacific coast. He began early to investigate the values to be found in the black sands of the ocean beaches and of the hydraulic mines. For a great number of years be contributed largely to the local technical press on the subject of saving fine gold in the quartz and placer workings, and became an enthusiast on the subject. He was one of the earlier miners on the Comstock lode in Nevada, having gone there at once on the discovery of gold, but eventually returned to California. In earlier days he visited all the mining excitements on the coast and in this way acquired a great amount of practical knowledge and a wide acquaintance. He was a constant investigator of metallurgical processes connected with gold and silver mining. For the past 10 years or more he had confined his attention to his mining interests in the quartz properties in Shasta county. Mr. Paul was an enthusiastic advocate of the mining industry of California and was well known all over the State.

Societies and Technical Schools

Institution of Mining Engineers of Great Britain—The office and headquarters have been transferred from Newcastle-upon-Tyne, England, to 39 Victoria street, London.

Massachusetts Instituteof Technology—The electrical engineering courses are now attended by a number of graduate students, who are pursuing the advanced courses offered. The electrical department needs larger quarters, and it is hoped that they will soon be provided.

Iowa Engineering Society—This society held its 21st annual convention at Waterloo, Iowa, Jan. 13 and 14. The following are the officers for the ensuing year: President, C. T. Wilson, Waterloo; vice-president, T. R. Warriner, Cedar Rapids; secretary and treasurer, A. H. Ford, Iowa City; directors, L. H. Stone, Cedar Rapids and C. P. Chase, Clinton.

Indiana Engineering Society — The twenty-ninth annual convention of the Indiana Engineering Society was held in Indianapolis, Jan. 14, 15 and 16. Professor W. K. Hatl, of Purdue University, is president and Charles Brossman, of Indianapolis, secretary. The program for the present convention was unusually full of interesting subjects, which were discussed by prominent men. The committee on mining consists of C. J. Colgan, Linton; Frank A. Kaffman, Brazil; P. B. Breneman, West Lafayette. Mr. Colgan made a report on conditions of the Indiana mines and mine engineering, Jan. 15. A report on "Comparative Tests of Indiana Coal" was made by Prof. C. A. Young, of Lafayette. George W. Munroe gave an illustrated lecture on "Producer Gas from Indiana Coal." The meeting closed with a banquet and other social features were introduced.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Goldfield, Salt Lake City and Denver

REVIEWS OF IMPORTANT EVENTS

San Francisco

Jan. 11—The Natomas Consolidated, of California, the new corporation which has acquired extensive dredging interests both at Folsom and Oroville, intends utilizing all the rock piles thrown up by the numerous dredges by crushing the cobbles into road-making material. After removing the cobbles the land left is suitable for agricultural operations, and thus one of the objections to the dredging industry may be removed. The company owns certain valuable water rights, and has obtained options on about 50,000 acres of land which is to be brought under irrigation and sold to settlers. This land has been more or less subject to overflows, and will be reclaimed and made fit for cultivation. The water used for power purposes can be later used for irrigating this large tract of land in Sacramento county.

The Anti-Débris Association has also succeeded in bringing the dredge miners into line in some measure. A committee was appointed to visit the Oroville dredging field and determine whether suit could be commenced against the dredge owners. The Dredge Miners' Association has now written to this Anti-Débris Association committee, agreeing to comply with all the demands and promising that no material should be allowed to reach the Feather river. The Anti-Débris Association has usually whipped the miners in any litigation, and doubtless the dredge miners want to avoid litigation if it is a possible thing.

The current at the Big Bend plant of the Great Western Power Company has been turned on for the first time. At the start some 50,000 h.p. will be generated, to be increased later on to 100,000 h.p. The lines have been carried complete from Big Bend in Butte county as far as Oakland, on the bay shore.

A new schedule of rates on ore will be adopted on the Tonopah & Tidewater railroad on Jan. 24, which will have a marked effect on mining affairs both in this State and Nevada. The reduction will admit of handling ores which are at present of little or no value, as they cannot be shipped to smelters. A better profit can also be made by the miners on ores of the character now being shipped. The new freight tariff will also probably have the effect of sending more ores to the smelting plant at Needles, San Bernardino county, and somewhat less to the smelters on San Francisco bay. The new tariff shows an entire readjustment on rates of varied grades of ore. The Tecopa district in Inyo county, where much lead ore is being mined, pays a flat rate now of $8.89 per ton on ore from $50 to $100 in value. Under the new rate $60 ore will pay $4.95; $70 ore, $6.45; and $100 ore will pay but $8.20. On the lower grades from Tecopa district the rate on $15 ore is reduced from $2.61 to $2; and on $40 ore from $3.98 to $3.25, and the intermediate grades in proportion. The new rates from Goldfield cut the charges from $2.60 on $40 ore to $2.75 on $15 ore. The rates from Rhyolite and Beatty districts are cut also, and are from 50c. to $1 less than from Goldfield. These rates should change shipments from Salt Lake and San Francisco to Needles and will benefit the different mining camps along the line of the road.

In this connection it may be stated that merchants and manufacturers and others in this city are making a determined fight against the proposed higher east- and west-bound freights on the transcontinental railroads. An organization has been perfected and the shipping community is pulling together.

The second furnace of the new copper-smelting plant at Coram, in Shasta county, has been blown in, and the converter plant will be ready for operation in a few days.

The Leona Chemical Company has issued bonds to the amount of $1,000,000, and will now greatly enlarge its chemical manufacture plant at Melrose on San Leandro bay. The company will manufacture industrial chemicals from raw materials taken from its own mines. The pyrites deposit at Laundry Farm will give the materials for extensive sulphuric-acid making, and the barytes mine in Mariposa county will furnish the ore for making paint materials. A number of minor products will also be turned out. Roland L. Oliver, of Oakland, is general manager, and F. M. Smith is largely interested.

Goldfield, Nevada

Jan. 12—At the annual meeting of the Goldfield Consolidated held yesterday at Evanston, Wyo., several changes were made in the directorate of the company, which now stands as follows: Senator George Nixon, president; George Wingfield, vice-president; W. C. Ralston, of San Francisco, treasurer; J. M. MacKenzie, manager, Charles Hayden, of Boston, J. H. Carstairs and J. D. Hubbard, directors. John S. Cook, James R. Davis and J. M. Fenwick are the retiring directors; the latter to act as private secretary for George Wingfield. Dividends of 30c. per quarter are to be resumed on March 1; this will mean a quarterly distribution of $1,080,000.

Davis & Loftus, who have taken over the property of the Bullfrog Gold Bar Mining Company, have submitted to the stockholders a plan of reorganization and are desirous of obtaining the name and address of every stockholder in the company that they may present to every one the outline of this plan.

While little is heard of the Gold Mountain district, there is a large amount of development work being carried on. The Bonnie Clare Mining Company which is prospecting the May Day lode by an adit is meeting with encouraging results. This property was closed down a year ago due to dissention among the principal stockholders, who allowed the company to go into the hands of a receiver; the receivership has since been dissolved. A large amount of supplies have lately been shipped into the old Oriental mine in that district, and extensive development work is to be carried on. It will be remembered that some of the finest specimens of gold ore ever exhibited came from this property; this ore is now in the museum of the Smithsonian Institute at Washington.

Unfortunately, this district has suffered in the past by poor management of its properties and the greediness of mining promoters, but with good economical management and better milling facilities, many of the properties now idle can be made paying propositions.

A contract is to be let shortly for the construction of a telephone line from Tonopah to Helena, the new town near the Broken Hills mine, and about 40 miles east of Tonopah.

The Champion traction engine, built to haul 20 tons of ore from the Great Western mine at Hornsilver to its shipping point, Cuprite on the Tonopah & Tidewater railroad broke down on its initial trip last week. New parts were ordered, and mule teams are being used until these parts arrive.

L. J. Cohn, register at the Carson City land office, reports that during the month of December 125 final mineral entries were made on mining claims, involving payments of nearly $30,000 by the claimants.

The Western Ore Purchasing Company, whose plant was destroyed by fire at Hazen last week, has purchased the old

Scott & Amann sampler at that place and will use it while a new plant is being erected. The sampler of the Western Ore Purchasing Company at Hazen, Nev., was totally destroyed by fire Jan. 3, the loss being in the neighborhood of $60,000, partially covered by insurance. At the time of the fire there was about 1500 tons of ore stored in the bins, which will be shipped to Salt Lake City for sampling. The plant will be rebuilt at once on a larger scale.

The Nevada Bay State Oil Company, which has been drilling for oil in the salt marsh northwest of Goldfield but was compelled to stop operations due to the cable's breaking, has received a specially designed fishing apparatus from Los Angeles, and will endeavor to recover the cable. The well is 500 ft. deep.

The sulphur mine at Cuprite, 15 miles south of Goldfield, shipped four carloads last week, and it is reported that this amount will be shipped to Los Angeles each week.

The old camp of Candelaria, in the northern part of Esmeralda county has taken its place again on the shipping list. Last week the Potosi Mining Company made a shipment of 175 tons of ore to the smelter at Bingham Junction, Utah.

Owing to the financial depression during the past year, a number of mining companies and many individual claim holders neglected performing the annual labor prescribed by law on their lode claims, which technically amounts to abandoning the same. As a result on Jan. 1 a great many re-locations were made throughout the State.

By means of an injunction Horton and Aldrich, of Chicago, have secured a postponement of the annual meeting of the Little Florence until Jan. 20. The meeting will no doubt be a lively one as the feeling between the two factions is very bitter, and sensational charges have been made by both sides.

Salt Lake City

Jan. 15—Twenty-two cars of machinery for the Ohio Copper Company's mill arrived at Lark during the week. The jigs are already in place, but the slimers and tables have not arrived. The last shipment consists mainly of transmission machinery—transformers, shafting, pulleys, belting, etc. The raise from the Mascotte tunnel to connect with the shaft of the Ohio Copper Company is progressing rapidly so that connection should be made by the end of February.

At Garfield the Fink furnace is said to be meeting with considerable success in making high-grade matte, but owing to trouble with the furnace lining as yet no attempt has been made to make blister copper directly from the ore. An automatic feeder is being installed, and it is said that as soon as that is in place the attempt to make blister copper will be made. Samuel Newhouse is so greatly pleased with the Fink experiments that he has announced that the Cactus mine will be equipped with a 300-ton Fink smelter even if the furnace fails to make blister copper.

It has been demonstrated that the plant can make matte carrying as high as 70 to 80 per cent. copper successfully and rapidly, and it is claimed that within a short time the furnace will be turning out blister copper with the same ease with which it is now producing matte. The plant consists of two revolving cylinders which smelt and roast alternately, the smelting cylinder generating gases which are utilized as fuel in the roasting cylinder. In starting the process some coal is required, but once in operation the sulphur gases do the roasting. Both the roasting and the smelting of the concentrates is accomplished with a single fuel charge, and the cooling of the calcines is avoided. Furthermore the fumes are caught and do not enter the stacks. When the concentrates have been converted into matte the slag is drawn off and a charge of silica added in order to reduce the ferrous oxide. The matte is kept agitated by the revolving cylinder and by forcing air into it converted into blister copper. The plant is very inexpensive compared with the ordinary smelting plant, and is extremely simple.

Butte

Jan. 14—The continued cold weather which has prevailed throughout the State for the past two weeks has seriously affected the output of the Butte mines. For the past week the Boston & Montana smelter at Great Falls has been operating at about one-third its normal capacity. This is due partly to the diminished water power caused by freezing of pipes, but chiefly to the fact that the ore in cars shipped from Butte is frozen solid during the journey and the only way to get it out is to mine it over again. The greater part of the Great Northern railway's ore cars are now at Great Falls loaded with ore which it is impossible to remove. As a consequence there is a car shortage in and around Butte, and the mines of the Boston & Montana company, which ship to the Great Falls smelter, have been closed down since last Friday. Owing to the peculiar cause of the shutdown it is not known just when shipping will be resumed. At the Washoe smelter at Anaconda no trouble has been experienced with frozen ore. This is because of the shorter haul for the ore and also because at the Washoe plant the cars are immediately run into drying sheds, where a sufficiently high temperature dries out the ore and loosens it.

At the annual meeting of the Montana Society of Engineers, held at Great Falls last week, C. H. Bowman, of Butte, president of the Montana State School of Mines, was elected president of the society for the ensuing year. Steps were taken toward obtaining favorable legislation for the proper supervision of the county roads, a committee being appointed to confer with the members of the legislature on the subject.

The British-Butte Mining Company has instituted action against the owners of adjoining claims for the purpose of obtaining the right to run ditches so that the company's new gold dredge may be operated. The company alleges in its complaint that it has erected a gold dredge upon its property at a cost of $80,000, and that unless it can obtain the right to run the ditches the new dredge will be valueless.

Denver

Jan. 16—The most lively topic of discussion in mining circles at the present time is the anticipated advent of the new independent smelting company into the mining districts of the West. This company, with $50,000,000 capital, is said to be backed by the Standard Oil, Amalgamated, Ryan-Cole, and allied interests. It is confidently expected to commence the erection of a large copper plant near Salt Lake City at an early date.

Now comes the resignation of Dennis Sheedy from the board of directors of the American Smelting and Refining Company, and a strong rumor that he is going on the board of the new competitive company, with the further inference that the new company is going into the lead-smelting business in this State, in active competition with the American company at the latter's own exclusive game.

The mineowners are, of course, pleased to learn of the entry of another "Richmond in the field," with the possibility of a sanguinary struggle, and slashing of treatment rates right and left.

Such, then, are the points of active discussion in mining circles at the present time. To people conversant with the mining and smelting situation in Colorado the question arises, "Where will the ore be obtained?" and particularly lead and fluxing ores, on which the American Smelting Company has for some time yet exclusive call. Colorado is a great mining State, and with the material lowering of treatment charges, the output of low- and medium-grade ores will be greatly stimulated, and there is a strong possibility that the new company, starting in the smelting business with ample capital and modern works, carrying only the actual cost of construction, paying nothing for good will of a former business, and not saturated with water, will find an ample and profitable field in this State, to the great advantage of the mining community as a whole.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

GRAHAM COUNTY

Arizona Copper—A loss of about $200,000 was caused by fire at the smelter due to a runaway slag train. Concentrator No. 2 is a total wreck, while the engine room, smelter, ore and coke bins, were badly damaged.

Kentucky—A strike of copper glance is reported at a depth of 225 feet.

New York-Arizona—During the past two years $24,000 has been spent in development work. Most of the work is being done in the Lillian tunnel which is 1000 ft. long, and has attained a depth of 300 ft. Four hundred feet more work in this tunnel will tap shafts from which ore shipments have been made. A compressor is being installed. The water supply is from the pipe line of the Morenci Water Company.

Gold Belt—About $18,000 worth of copper ore was shipped during 1908. Operations will be resumed at once.

Morenci Water Company—A steel bridge has been built across Eagle creek. It is a one-span trestle 187 ft. long and 14 ft. above the river bed, and is for the purpose of holding the heavy 10-in. pipe line out of danger of high water during the flood season. Heretofore the pipe line was under the ground, but this was very unsatisfactory as the floods invariably broke and injured the pipes.

PINAL COUNTY

Ray Consolidated—Plans are being drawn for a large reduction plant, work on which will begin about the middle of this year. Eleven prospecting drills are at work and ten acres have been prospected during the past month, proving low-grade copper deposits.

California

AMADOR COUNTY

Central Eureka—The shaft has been retimbered to below the 2000-ft. level, but bad air has given some trouble.

South Eureka—Another assessment has been levied on the stock of this company. The stockholders are persistent, for they have been paying assessments off and on for about 20 years with only an occasional profitable orebody.

CALAVERAS COUNTY

Eastland-Gray—This gravel mine has been sold to S. R. Fox who intends working it by some dredging system. The mine is near San Andreas and operations have been resumed.

Voinich—Active work has been commenced on this Angels Camp mine. A body of ore on the 600 level is to be worked.

EL DORADO COUNTY

Garden Valley District—A. R. Seymour has leased, with the privilege of purchase, 20 acres of mining ground in this district and has begun operations upon it.

INYO COUNTY

Monster—The first shipment of ore under the new management has been made by this mine to the smelter at Keeler. The ore runs high in lead with considerable silver. A. A. Stanton, of Los Angeles, is manager.

KERN COUNTY

Fairview—The quartz mill of this mine near Rosamond is nearly ready to be started.

MARIPOSA COUNTY

Hornitos—A new mill, quartz crusher, etc., for this camp is now being hauled in from the railroad. Considerable prospecting is going on in that locality.

NEVADA COUNTY

Bear River—Arrangements are being made by the owners to bond this mine to Eastern men. They have been working the tunnel for two years and while a 2-ft. ledge has been found, there is no pay ore as yet.

PLACER COUNTY

Long Beach Asbestos Company—This company, of Long Beach, Los Angeles county, intended to manufacture helmets and coats for firemen and other articles from the asbestos found near Towle. Thos. E. Morgan, of Dutch Flat, however, on the last day of the year relocated the asbestos claims on the ground that work had not been done on them in accordance with the law.

PLUMAS COUNTY

Rose Quartz Mining and Milling Company—This new company intends working the group of seven claims owned by F. H. Kelley on Poormans creek, in Onion Valley district. The claims are only partly developed. F. H. Kelley and O. C. Pratt, of Quincy, are among the incorporators.

SIERRA COUNTY

Dead Broke—The White Bear Mining Company is about to reopen the old tunnel on this mine. The ledge carries large quantities of sulphurets which were laid aside in early-day mining but are now valuable.

SISKIYOU COUNTY

Hardscrabble—This company at China Gulch has purchased a gasolene engine for power purposes.

Quartz—A new company has taken hold of the group of quartz mines owned by Foster & Mackintosh at Nigger Creek, near Callahan.

TRINITY COUNTY

West Point—Mark Manley for this company has bonded the Leas and Nicholson mines which adjoin the Brown Bear property at Deadwood. There are five claims.

TUOLUMNE COUNTY

Harvard—Fifty of the 60 stamps of the mill at this mine are dropping and the other 10 will be put in use as soon as the concentrators are installed.

Tarantula—This mine near Chinese has been sold to C. F. Crawford representing English capitalists, by Joseph Russell; an air compressor and machine drill have been ordered.

Colorado

BOULDER COUNTY

Alton—Kansas City and Chicago men are interested, and they will get plans for the erection of a milling plant. W. R. Burke, Boulder, Colo., is manager.

Mount Audubon Power Company—This company is going to build a hydroelectric plant at its property, expecting to generate about 1500 h.p., the estimated cost of the complete plant to be $75,000. J. E. Haggard, Ward, Colo., is manager.

Rip Van Dam—Denver people have purchased one-half interest with William Brown at Springdale, Colo., and heavy developments are being mapped.

CLEAR CREEK COUNTY

Linn Consolidated—An air compressor is being installed at the property near Georgetown.

Pioneer & Monitor Group—P. W. McCaffney, of New York, has purchased these groups near Dumont, the consideration being reported at $150,000, on which

a cash payment of $25,000 was made. New and heavier machinery is to be installed and an electrochemical process will be tried in the mill.

Santiago—It is reported that in the spring this company will arrange for the erection of an aërial tramway from the mine to its mill at Georgetown, a distance of three miles.

Snowdrift—Nashville, Tenn., people are interested in the purchase of this group, and they will develop their holdings through the tunnel, near Georgetown, as the Snowdrift Mining Company.

Vidler Tunnel—After an idleness of over a year a contract has been given to F. A. Goetz, of Georgetown, for the driving of 200 ft. on this tunnel in the Argentine district.

LAKE COUNTY—LEADVILLE

Banker Tunnel—This tunnel, Winfield, is in 4000 ft., and for several hundred feet has been driven through a mass of low-grade ore. A few days ago a streak of ore came into the low-grade body which runs high in gold, silver, copper and lead. This ore is being sacked. The manager of the property is at present East consulting with the stockholders as to erecting a mill in the spring to treat the low-grade ore. The principal stockholders are in Philadelphia, with Doctor Horner, of that city, as president of the company.

Cleveland—Sinking has started on this mine, South Evans gulch, and the shaft will be sent down another 100 ft.; good progress is being made with the work, as there is little water to handle, not over 25 gal. a minute.

Gallagher—The new shaft on this property, to the north of the original shaft, has opened ore carrying some gold and silver and a large percentage of lead. Ore is being shipped from the old shaft steadily.

Helena—The station at the 700-ft. level, Iowa gulch, has been cut and a new pump is being installed; it is large enough to handle the flow of water easily, so that the next 100 ft. of sinking will be easily accomplished. With every foot of sinking the formation changes and the management looks for the orebody before the contract is completed.

Progressive—The body of ore recently opened in this mine, North Fryer hill, is now 9 ft. high and 7 ft. wide, with top and bottom not reached. Shipments are going out steadily.

Vinnie—High-grade gold ore is being taken from this claim, Breece hill. The streak of this rich matter is in a body of medium grade ore. The vein runs into the Ibex ground about the tenth level.

Young America—The owners of this mine, Granite, state they have on the dump 15,000 tons of ore that will average $10 per ton, and on account of the heavy transportation charges they are unable to ship it. To overcome this they will erect a mill in the spring to treat the ore. The mill will be a custom one as well, as there are a number of dumps in the neighborhood that can be treated.

TELLER COUNTY—CRIPPLE CREEK

The Cripple Creek district enters upon the new year with bright prospects. A large amount of mining is being done, both by the companies and leasers. All is quiet in labor circles and the relations between the employer and the miner are cordial. The Mine Owners' Association is in control, and the card system is being enforced the same as it was a year ago. The drainage tunnel is being pushed steadily along. The milling situation is about the same as last year, with the exception of a little higher rate on some of the ores where there is no contract with the mill. There is a general tendency toward more reasonable royalties than in former years. A large amount of leasing is being done both by companies and by individuals in a small way.

Blue Bird—Connection has been made between the bottom level of this property and one of the Portland drifts, thus giving good air. The Blue Bird is under lease to the Humphreys-Thompson people, of Denver, and is said to be doing well. H. D. Thompson, of Cripple Creek, is in charge of the property.

El Paso Consolidated—A change has been made in the control of this company. Four of the old directors, S. S. Bernard, J. M. Beatty, George Bernard and E. J. Eaton have resigned and new directors have been put in. The present board consists of A. L. Burris, A. J. Styber, A. L. Doud, William Bainbridge, A. Kemple and J. H. Avery. Mr. Burris will be president and general manager and Mr. Bainbridge, who was formerly superintendent of the property, will be consulting engineer. For the past year there has been a struggle between the Bernard factions and that headed by Burris for the control of the company, and it was expected that there would be a fight at the annual meeting which occurs in March, but matters were precipitated by the calling of a special meeting. The property of the company is at present being operated under lease by a number of leasers. Mr. Burris lives in Colorado Springs.

Half Moon—The shaft-house on this property has been totally destroyed by fire. The property is controlled by the Stratton estate and is at present under lease to Charles Harrison and associates, of Cripple Creek. This property at one time produced a very large amount of ore.

Indiana

PIKE COUNTY

Solomon Deeble & Co., coal operators, of Carlisle, have leased several hundred acres of coal land north of Petersburg, near the Evansville & Indianapolis railroad. The company will begin sinking a shaft at once. There are two veins of coal underlying this land—one a 4-ft. vein and the other a 7-ft. vein. Both will be worked, giving employment to several hundred men. The mines at Blackburn, Little Rodgers, Massey, Ayrshire, Fortwell and Winslow are operating from three to six days a week, and the railroad is now running from two to three extra coal trains a day. The Worley mines, owned by Arthur Jordon, of Indianapolis, which have been idle for two years, will be opened in a short time. The vein in the Killians mine has been found to be 13 ft. thick, and the coal is said to be of very good quality.

Louisiana

Petroleum production in Louisiana in December was 358,600 bbl. Shipments by rail were 203,128 bbl.; pipe line, 112,639; total, 315,767 bbl. During December 15 wells were completed, 12 being in oil and three dry. There were 44 wells drilling at the end of the month.

Michigan

COPPER

New Baltic Exploratory Company—Exploratory work has begun on the lands of this company which lie to the east of the Franklin, Jr., in view of opening the northern extension of the Baltic lode. Operations will be confined to trenching and drilling.

Superior—This company is accumulating rock preparatory to putting through another mill test. The first mill run consisting of about 900 tons yielded nearly 38 lb. of copper per ton. The rock is coming from the drifts of the four lower levels.

Atlantic—The crosscut from the 19th level of this company's shaft has struck the lode, but it has not yet been extended far enough to ascertain its conditions. The crosscut driven from the 15th level has encountered a lode at a distance of nearly 400 ft. from the shaft; its identity has not as yet been definitely decided and results of its further opening will be awaited with interest, as it may have a bearing on the future development of the property.

Calumet & Hecla—The first quarter of this company's large regrinding mill has gone into commission and is treating the tailings from the Calumet mill. The ultimate capacity of this plant will be about 10,000 tons daily, and it is to contain 48 Chilean mills and 200 Wilfley tables. The Chilean mills with their quota of tables are arranged in multiples of six, each set driven by a 250-h.p. 2300-volt induction motor.

Michigan—Construction work on this

company's stamp mill is going on in a limited way and the trestle approach to the building is being erected. Conditions are improving at depth in the mine. "A" shaft is sinking close to the 17th level and "B" shaft is down to the 14th level; the drift extended from this level is entering into a good copper-bearing formation after passing through practically barren ground for a considerable distance.

King Phillips—No. 1 shaft of this company has opened the lode by means of crosscuts to the 10th level, and the lower workings are yielding a good grade of rock which is being accumulated in a stock pile. No. 2 shaft is crosscutting to the lode at the sixth level. The recently installed electric hoisting equipment is working satisfactorily.

Wyandot—Drifting continues on the amygdaloid lode that this company cut with its crosscut from the bottom of the exploratory shaft, and the copper showing is being maintained. This is the most important showing yet made on this property.

Tamarack—No. 1 shaft of this property is being put into shape to handle all the mine water from this tract, and a large concrete tank is being erected to store the water preparatory to its being hoisted.

Mass—This company has started to drive two crosscuts from "A" shaft to intercept the lode that was opened by a drill hole. One is being driven from the 15th level and the other from the 17th level.

Allouez—No. 2 shaft is down to the 13th level; the shaft is being turned so as to conform with the pitch of the formation which is expected to be cut within the next two levels.

Copper Range—This company will in all probability give up its option on the Globe tract upon its expiration in April. A shaft has been sunk to a depth of 1000 ft., and at that depth much prospecting has been done without finding anything of commercial value, or even any indications that would warrant further prospecting. One of the drills operating on the lands adjoining the old Atlantic property is down about 650 ft. and the other nearly 600 ft. Results from these holes are being awaited with interest as it is maintained that the northern lodes of the section extend across Portage lake and in proximity to these lands.

Winona—The directors will take action shortly regarding another assessment; this will probably be $1 per share. The last assessment was $2, of which $1 was paid in the fall of 1907, and the balance in February, 1908. The need of additional funds at this time is due to the fact that the extensive development work which was carried on during 1908 and which cost between $140,000 and $150,000, has practically exhausted the working capital. The Winona discontinued rock shipments in November, 1907, at the time of the break in the price of copper. It is proposed to resume shipments this spring. A much larger output is expected than heretofore. In 1907 the Winona shipped 102,100 tons of rock to the Adventure mill. The yield was 2,231,445 lb. of mass and mineral, or 1,285,863 lb. of refined copper, being 12.59 tons of refined copper per ton of rock shipped. By a more careful selection the management expects the yield can be brought up to 14 pounds or better without a material increase in cost.

Missouri

Zinc-lead District

The natural-gas supply proved inadequate during the recent cold weather causing many of the mines and mills using gas to shut down.

Apache Maid—Barr, Gloniger & Walsh have let the contract for the erection of a 300-ton mill on their lease of this mine on the Troupe land south of Webb City.

Holdout—This company, composed of Chicago and Webb City parties, has been incorporated for $32,000. Frank Forlow, of Webb City is attorney.

Knights—Several rich drill strikes on the Sampson land near Knights station bid fair to make this a producing camp.

Kathleen—This company has been incorporated with a capital stock of $50,000, to operate at Belleville. W. F. Hilles, Dallas, Texas, J. Wise Brown, E. A. C. Elliott and F. B. Wilcox, of Joplin are the stockholders.

Transylvania Royalty Company—J. P. Newell, of Carthage, and New York parties have incorporated this company with $100,000 of capital stock.

Montana

Butte District

Amy Silversmith Mining Company—Several new leasers have lately begun work. The work is for the most part confined to the 300-ft. level.

Butte & Superior—The shaft has reached the 1400-ft. level where a large station is being cut and a pump installed. It is reported that more copper ore has been encountered on the 1200-ft. level where development work is now being carried on.

Davis-Daly—The Colorado shaft has reached a depth of 1400 ft. Below the 900, the shaft has three compartments; above this point it has but two. Ground is now being stoped out, from the 900 up, which will make the entire shaft three compartments.

Butte-Montana — The company has shipped three 50-ton cars of ore from its Alec Scott mine to the Washoe smelter this week.

Butte Central Copper Company—This company has been recently organized under the laws of Delaware. The company is capitalized at $2,500,000, with 250,000 shares of the par value of $10. When the old Butte Central & Boston Copper Corporation has been discharged from bankruptcy and its affairs untangled, the new company will assume control of the Ophir mine and begin operations. Freeman I. Davidson, largely interested in the old corporation, is instrumental in the formation of the new company.

Surprise Eagle Company—At a recent meeting of the directors it was decided to levy an assessment of one cent per share on all outstanding stock for the purpose of providing a working capital.

Fergus County

Barnes-King—President Gillie has recently published his anual report to the stockholders. The report covers the period for the past 14 months, and contains reports of General Manager McGee and Treasurer Swinborne. It is stated that under the new management the monthly deficits of 1907 were changed into monthly profits in 1908, and that the cost of mining and development has been reduced from $4.18 per ton to $2.53. The treasurer's report states that on Nov. 30, 1908, there was a balance in the treasury of $225,113.41, but that it will be some time before a dividend can be declared.

Jefferson County

Corbin Copper Company—At the first meeting of stockholders the following directors were elected: Stephen R. Dow, Alvin R. Bailey, Noah W. Jordan, George E. Learnard, David E. Dow and Richard M. Edwards. Stephen R. Dow is president and Alvin R. Bailey, secretary and treasurer.

Kelly Smelting and Refining Company—At a meeting of stockholders held in New York the name of the company was changed to the Alta Montana Copper Company. The company owns the Alta group near Corbin.

Nevada

Esmeralda County—Goldfield

Goldfield Consolidated—The Clermont shaft, which will be the main working shaft of the company, is now 920 ft. deep. The Mohawk vein was intersected at 856 ft., 20 ft. lower than the bottom of the old Mohawk shaft. On passing through the hanging wall, quartz of a milling grade was entered, which showed for 60 ft. in the shaft; the barren spot which was then cut, still shows in the bottom of the shaft. Construction on the shaft house has already started, and the 200-h.p. hoist, which will be operated by compressed air, is daily expected.

Red Top—Drifts are being extended north and south on the lower level; an advance of 150 ft. was made last month.

Florence Goldfield—The new Florence mill commenced operations Jan. 9 with 10 of its 40 stamps dropping; the number will be gradually increased to the full capacity. In the Florence property large bodies of ore have been blocked out by the various leasers. This ore will be treated before much more development work is done. No new leases are being granted nor will extensions be given to any of the present leasers.

Florence Gem Lease—High-grade ore was struck a few days ago; two wagon-loads of ore a day are being sent to the sampler.

Atlanta—Eight sets of lessees are working on this property; while small seams of good grade ore have been opened in several places, nothing of sufficient size to warrant shipping has been developed.

Goldfield C. O. D.—In a winze from the 250-ft. level 15 in. of high-grade ore was recently opened. Work is still progressing in the winze, and the drift on the 300-ft. level is being pushed to catch this oreshoot. The company has a large tonnage of milling ore developed.

Consolidated Red Top Lease—While the management will not give out definite figures, it is generally known that the face in the oreshoot found between the 225- and 300-ft. levels, is showing richer than ever before. The drift on the 300-ft. level is being extended south to catch the oreshoot on its downward pitch, and, as ore assaying $30 per ton now shows in the breast, it should be close to the shoot.

ESMERALDA COUNTY—STIMLER

Cottonwood Mine—Returns from a 20-ton shipment from this property gave $62 in gold and $51 in silver per ton. In the bottom drift, where the dike was cut, the orebody is 40 ft. wide. The property is equipped with a 20-h.p. hoist. Considerable development work is being done.

NYE COUNTY—BULLFROG

Smith Brothers' Mill—It is reported that Smith Brothers have made arrangements which will enable them to resume operations on their custom mill at Beatty, and that work will be rushed from now on to completion. With the exception of the cyanide tanks, the material is now on the ground. This is a ten-stamp mill; the batteries were furnished by the Hendrie Bolthoff Company. The mill will be run by electric power obtained from the Nevada-California Electric Power Company.

Shoshone—The returns as given by the State bullion-tax collector credit the Shoshone with a production of $535,763 for the first nine months of 1908. The "glory hole" is nearly 150 ft. long by 100 ft. wide by 200 ft. deep at the west end; over 10,000 tons of ore are now broken in the glory hole. The ore goes through chutes to the 200-ft. level whence it is hoisted to surface.

Gold Bullfrog Mining and Milling Company—A 25-h.p. gasolene hoist has been installed on this property and sinking will be resumed; the shaft is now 150 ft. deep.

Mayflower—The buildings for the new five-stamp mill have been completed and are now ready for the machinery, nearly all of which is on the ground. A station has been cut at the 500-ft. level; water for the mill will be pumped from that level. There is sufficient ore on the surface to supply the mill for two months; this, together with ore blocked out on the 200-ft. and 300-ft. levels will supply the mill until lower levels are ready for production.

NYE COUNTY—SPRINGDALE

Newcomer Mill—The 50-ton custom mill being built by Scott Newcomer at Springdale is nearly completed and is expected to be in operation by the end of the month. Should the treatment, which consists of roasting before cyaniding, prove a success, the Pioneer mine will furnish the mill with all the ore that it can treat.

NYE COUNTY—BULLFROG

Bullfrog Mining Company—A 10-ton shipment to the Western Ore Purchasing Company from the Stewart & McVicar lease on Ladd mountain gave returns of $86 per ton.

Pioneer—This property is still the center of attraction. The drift from the sub-winze shows 15 ft. of ore that assays more than $100 per ton as it is broken.

NYE COUNTY—TONOPAH

Belmont—Extensive development work is being done on the 1100-ft. level, the deepest point at which ore has been found in Tonopah. In the raise from the 1100-ft. level the company is working on the largest body of ore yet developed in this mine. This is the same body of ore in which the big winze from the 1000-ft. level was sunk, and which was exposed on that level by a drift for a distance of 200 ft. Owing to the divergence of the two faults which terminate this oreshoot on the 1000-ft. level, it should be exposed for a distance of more than 400 ft. on the 1100-ft. level.

NYE COUNTY—MANHATTAN

Moore Lease No. 5—In a test at the Vieth mill 18 tons of ore from this lease on the Manhattan Earle property yielded 61 oz. of amalgam, which it is estimated will make an average of $45 gold per ton of ore. The ore was all taken from the working shaft now 90 ft. deep. The company intends to install a gasolene hoist.

NYE COUNTY—ROUND MOUNTAIN

Jefferson Mine—Charles Kanrahat, who recently sold this property to the McBeth syndicate, of New York, is authority for the statement that there is now $43,000 worth of machinery on the ground and that $30,000 additional will have to be spent to properly equip the mill and mine.

HUMBOLDT COUNTY—SEVEN TROUGHS

Sandifer Lease—This lease recently broke into a fair sized body of high-grade ore on the 250-ft. level.

HUMBOLDT COUNTY—WINNEMUCCA

Intermountain Mine—Work is to be resumed on this property, which lies close to the town of Winnemucca. W. G. Adamson, superintendent of the company, states that the shaft, now 250 ft. deep, will be sunk to a depth of 400 ft., at which point it is expected to cut the Pride of the Mountain vein. This property was one of the early producers of the State and is credited with a production of more than $400,000.

Golden Eagle Mine—This property started work last week with Hasal Power as manager. For the present the ore will be concentrated at the company's mill and the product shipped. Later the company will erect a cyanide plant. The property is about 30 miles west of Winnemucca, and three miles from the Western Pacific at the old camp of Central.

North Carolina

IREDELL COUNTY

A deposit of asbestos is being opened near Statesville by Charles Lambert, of Pittsburg, Penn. The asbestos so far found is said to be of good quality.

Oklahoma

The production of petroleum in December is reported by the *Oil Investors' Journal* at 3,796,600 bbl.; deliveries, 3,112,018 bbl. Added to stocks, 684,542 bbl. Total stocks on Dec. 31 were 52,097,200 bbl., as estimated. During December 297 wells were completed, of which 271 were oil producers, 8 gas producers and 18 dry. There were 286 wells drilling at the end of the month.

OTTAWA COUNTY

Several drills are at work prospecting near Afton, and some strikes of zinc and lead ore are reported.

Oregon

LANE COUNTY

Much development work is being done in the Bohemia district, which lies partly in Lane and partly in Douglas county. This work is of a character that denotes permanency, as it consists of road building, the shipping in of machinery, tunnel work, etc. The miners of this camp have overcome the habit of doing only assessment work each year and are now expending all their available money on development work.

Vesuvius—The 10-stamp mill on this property near Bohemia postoffice is now running. The returns are said to be very satisfactory, but no details can be learned. Mr. Hand, who is manager of the Vesuvius mine, is also doing extensive work on the Oregon-Colorado and Riverside properties.

Combination Mines Company—This company was recently organized under the laws of Oregon, and has taken over the Combination mines owned by Clark Brothers. The officers of this company are R. H. Clark, of Milwaukee, Wis., president and treasurer; W. T. Clark, of Wenatchee, Wash., vice-president; J. W. Disch, of Milwaukee, Wis., secretary. The capital stock consists of 450,000 shares, par value $1; 200,000 shares are held in the treasury. This company has a high-grade concentrating property and is now installing machinery with which to work it. The Eastern office is at Milwaukee.

Martin Creek Mining Company—Good ore carrying gold and silver is being mined at this property near the Combination mines.

Mayflower Mines—Considerable development work is being done; machinery for a 100-ton mill is on the ground. The recent heavy fall of snow has caused a suspension of surface work, but it will be resumed as soon as the snow is gone. W. P. Ely is manager.

Twin Rocks Company—At the annual meeting of this company, recently held at Cottage Grove, the following officers were elected: President, Lewis Hartley, Cottage Grove, Ore.; vice-president, Geo. B. Spitler, Mt. Zion, Ill.; secretary-treasurer, W. B. Hartley, Cottage Grove, Ore. A block of 50,000 shares of stock was voted to be sold so as to raise additional money for development and machinery.

West Coast Mines Company—Several men are at work on this property and more will be put to work soon. It is the intention of the management to put the mill in working order and to commence dropping stamps as soon as enough ore is broken to assure a steady run for the 30 stamps.

Sweepstakes—A vein of solid quartz 16 ft. wide and rich in gold has been found at this property. S. J. Brund is owner.

Black Butte—This quicksilver mine about 12 miles south of Cottage Grove is now a paying proposition. For the last ten years money has been spent in development, and over four miles of drifts have been run to open up this large body of cinnabar ore. The furnace invented by Mr. Dennis, manager of the property, is in successful operation and considerable refined quicksilver is being shipped. This property is owned by New York men.

Pennsylvania

ANTHRACITE COAL

Finn Coal Company—The district court has issued a peremptory order directing this company to take measures at once to extinguish the fire which has been burning in its colliery at Carbondale for more than a year. The order was issued in a suit brought by residents of the town, who complained of the gases escaping from the mine, and also of the danger of surface caves, as the coal below was burned out. The company has given notice of an appeal to the Supreme Court.

South Dakota

LAWRENCE COUNTY

American Eagle—Before the mill can be operated a water supply must be secured. The company will in the spring run a crosscut from rimrock to rimrock, build concrete dams and pump the water to the mill. The mine will be developed all winter.

Branch Mint Operating Company—Manager Hecht, of New York, is dropping 60 stamps daily in the mill which is running on the old Richmond dump.

Homestake—Preparations are being made to erect a power plant on Spearfish creek that will use 100 cu.ft. of water per second. The plant will require 1½ years and $1,000,000 to build. Advertising the water right and ground has been commenced by the company.

PENNINGTON COUNTY

Fairview—Jerry Harrington is opening up this claim near Mystic, and has found a ledge of free-milling gold ore, 2 ft. in width, which will be treated in the old Cuttysark stamp mill that has been moved over to the property.

Forest City—This property, formerly the Clara Belle, at Oreville, is about to resume under the management of the Cleveland interests. A new shaft will probably be sunk.

Texas

The field reports from the southeast districts of Texas show 57 wells completed, 44 being oil producers and 13 dry holes. There were 71 wells under the drill on Dec. 31. The production of petroleum in December was 949,730 bbl. Shipments by rail were 618,722 bbl.; by sea, 147,512; total, 766,234 bbl. It is estimated that 150,000 bbl. were consumed in refineries and 75,000 bbl. in field operations.

Utah

SALT LAKE COUNTY—BINGHAM

Utah Copper—The seventh steam shovel is now in operation; there is still another shovel being assembled. Five steam shovels are stripping overburden and two working on ore. The mine is shipping, as nearly as the railroad facilities will permit, the full tonnage that can be handled by the mill.

Utah-Bingham—Since last fall the mine has been equipped with machinery, air drills, etc. The main vein has been developed for 900 ft. along its strike by three adits and raises connecting them. Considerable ore is developed, but owing to the condition of the roads shipping has been stopped until next spring.

Boston Consolidated—A serious cave has occurred in the Ben Hur adit.

TOOELE COUNTY

Shipments—During the week ending Jan. 1, the Sioux Consolidated shipped 11 carloads; Iron Blossom, 3; Eureka Hill, 3; May Day, 2; May Day concentrates, 2; Centennial Eureka, 24; Yankee, 2; Uncle Sam, 4; Gemini, 3; Eagle & Blue Bell, 1; Bullion Beck, 2; Colorado, 33; Dragon Iron, 10; Black Jack, 1; Swansea, 5; Lower Mammoth, 2; Brooklyn, 3 carloads. All these were 30-ton cars except those from the Colorado, Dragon Iron and Swansea mines, which were 20-ton cars. Six thousand five hundred bars of bullion were shipped from the smelter during the past week, bringing the total for the month of December up to 29,484 bars.

Shipments from the Tintic mines for the week ending Jan. 8 were as follows: Sioux Consolidated, 12 cars; Iron Blossom, 3; Consolidated Eureka, 44; Eureka Hill (leases), 6; Uncle Sam, 8; May Day, 4; Yankee, 3; Bullion Beck, 2; Ajax, 2; Colorado, 47; Dragon Iron, 23; Black Jack, 7; Brooklyn, 1; total, 162 cars. All these were 30-ton cars except the 20-ton cars from the Colorado, Dragon Iron, and Black Jack mines.

Lower Mammoth—About 300 ft. of the main shaft has been retimbered; it will require 90 days to complete the work to the 1200-ft. level. The assessment period will probably continue until fall. The officers of the company are John Dern, president; A. J. Stewart, vice-president; W. S. McCornick, treasurer. The other directors are D. L. Wertheimer, E. C. Coffin, A. T. Moon and M. P. Braffet. A. Reeves is secretary.

Little Chief—New machinery has been installed. The placing of guides for the counterbalance for the new hoist will require another week, as 1400 ft. of guides must be put in place. Drifting will then begin on the 1000-ft. and 1400-ft. levels.

Honerine Extension—At this mine at Stockton a blind lode has been found in a drift driven east on the Honorine vein from the Honerine company's old 600-ft. level tunnel. This is 600 ft. below the Honorine Extension tunnel. The orebody has been drifted on for 20 ft. and the ore is still good in the face. The width of the find is unknown, but the whole drift is in ore. The ore assays 25 per cent. lead, 14 oz. silver and $0.90 gold per ton. The

cross-fissure at which this ore is found was barren in the level above; the next cross-fissure is 125 ft. distant. As the find is in ground thought by many to be unmineralized, it promises to give new life to Stockton.

West Virginia

FAYETTE COUNTY

Nuttallburg Collieries Company—This new company, recently organized with $200,000 capital stock, has taken over the property of the Nuttallburg Coal and Coke Company, comprising 4160 acres of coal land, of which about 3000 acres are undeveloped; arrangements have been made for making several additional openings, and it is expected to double the present output. Dr. H. L. Kirkpatrick, Macdonald, W. Va., is president; John M. Alderson, Alderson, W. Va., vice-president; Angus McDonald, Charleston, W. Va., secretary; Lee Long, Charleston, W. Va., general manager and treasurer.

Wyoming

The principal producer of copper in this State continued to be the Penn-Wyoming Copper Company, of the Encampment district. During 1908 the smeltery of this company operated only 119 days, producing 2,384,356 lb. of copper from ore yielding 125.6 lb. per ton. The company is now operating a new and enlarged smeltery.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ended Jan. 9 were: Buffalo, 44,020 lb.; Coniagas, 35,630; Cobalt Central, 40,000; Chambers-Ferland, 80,000; La Rose, 193,560; McKinley-Darragh, 44,020; Nipissing 127,500; Nancy Helen, 40,000; Temiskaming & Hudson Bay, 80,000; Muggley Concentrator, 72,900; total, 777,850 pounds.

Crown Reserve, Cobalt—The annual meeting held at Montreal Jan. 12 was attended by about 200 shareholders. The statement submitted showed that after payment of dividend due Jan. 15, amounting to $283,210, the company would carry forward a surplus of $317,117. During the year ore was taken out to the value of $910,350. President John Carson estimated the value of the output for 1909 at $1,200,000 which, allowing $200,000 for operating expenses, would leave $1,000,000 available for dividends. The intention of the directors is to pay dividends quarterly at the rate of 24 per cent. per annum and such bonuses as may be justified by earnings.

Hargraves—The main shaft of this mine, Cobalt, is going down at the rate of 2 ft. per day, and has reached a depth of 90 ft. A crosscut will be run to tap the Jacobs vein at depth and will be continued 100 ft. beyond it to strike a strong parallel vein.

Nipissing—During 1908 this mine produced 7,062,527 lb. of ore yielding 2,897,446 oz. silver of a net value, f.o.b. Cobalt, of $1,384,447. The ore averaged 19c. per pound. Sinking continues at the Fourth of July shaft, which is now down 121 ft. At the Meyer vein the west drift has been prepared for stoping. The vein shows a width of from 2 to 8 in. averaging 3500 oz. silver to the ton, over a distance of 40 ft. At the Kendall shaft drifting is proceeding both ways on the new cross-vein. The north vein, which averaged 4 in. wide and assayed 2000 oz., has faulted. On the south end of the vein it has split into 3 stringers each about 1 in. wide and running from 1500 to 2500 oz. silver to the ton. The middle vein is being followed up.

White Silver—At this mine, on the Temagami reserve, a shaft is down 30 ft. on a vein carrying high silver contents. About $50,000 has been spent on machinery and development and a quantity of ore is awaiting shipment.

ONTARIO—KENORA DIVISION

Kenora Prospectors' and Mine-Owners' Association—The first general meeting of this association was held at Kenora, Jan. 12. The following officers were elected: Honorary president, Capt. H. A. C. Machin; president Major J. E. P. Vereker; vice-president, Thomas Walsh; executive committee, Mayor Rideout, John Nash, H. D. Alston, J. Beck, W. G. Cameron, J. A. Whitney and A. Stevenson. Committees were appointed to draft resolutions for presentation to the provincial government asking that the timber on lands patented by miners should become the property of the patentee, and that State aid should be given for the development of the mining resources of the district.

Mexico

CHIHUAHUA

Batopilas—A shipment of 200 bars of silver bullion was made from this old property in the western part of the State early in January. Production is increasing owing to recent important discoveries of high-grade ore.

Parral Output—The production of the Parral camp for the month of November was 34,485 tons, and for the month of December, 28,889 tons. For the last week of December it was 7815 tons, and for the first week of January, 7840 tons.

Las Cuadras—These old properties in the Santa Barbara camp are again active under the direction of Charles M. Dobson. Shipments are in progress.

San Antander—This mine in the Santa Eulalia camp is now outputting at the rate of one carload a day; the ore goes to the Chihuahua plant of the American Smelting and Refining Company. C. O. Calahan is the owner.

Rio Tinto Copper Company—This company's new 300-ton copper smeltery in the Terrazas camp is scheduled for blowing in not later than Jan. 20. The company is purchasing out-of-the-district ores, especially copper sulphide and silicious ores.

Minas Tecoletes y Anexas—The mill at this Santa Barbara property operated by the American Smelters Securities Company, is treating approximately 800 tons of ore daily. Since its remodeling the plant is operating more efficiently. The average value of the ores milled is given as 20 grams silver, 3 grams gold, 7 per cent. lead, and 8 per cent. zinc. Wet concentration is practiced. It is reported that the company has in view the early erection of a zinc plant for the treatment of a large tonnage of accumulated middlings and tailings. W. M. Drury is the manager in charge.

Palmar Mining Company—This company, operating in the Parral camp, is said to have lately opened up ore of minable grade, and is contemplating the installation of heavier hoisting machinery.

El Tesoro Mining Company—This St. Louis company is successfully operating several properties in this State, as well as in Sinaloa. Its more important mines are in the vicinity of Guadalupe y Calvo and Choix. W. C. Harlan and A. W. Warwick are directing operations. The mill at El Tesoro mine is in operation.

Concheño—Corrigan, McKinney & Co., of Cleveland, Ohio, have taken back this mine as the Greene Gold-Silver Company forfeited over a year ago upon its second payment after having paid $500,000 on the purchase price of $1,250,000.

JALISCO

Cinco Minas—At this mine in the Hostotipaquillo district which is being developed by the Marcus Daly estate under the direction of H. E. Crawford, a new body of ore has been found. It now appears certain that the Daly estate will complete the purchase of this property.

New Railroads—Considerable railroad building is going on in western Mexico. The Southern Pacific is building from Guaymas to Guadalajara as fast as it can. It is understood that the intention is finally to connect this road with the Pan-American at San Geronimo on the Isthmus of Tehuantepec. The Pan-American is now completed as far as the Guatamala border. The Mexican Central has its branch from Guadalajara to Manzanillo on the Pacific in operation

SONORA

Greene-Cananea—Six furnaces are now in operation. The production of copper for the past 17 months was 58,180,856 lb. The company employs 4000 men.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Jan. 20—In the Seaboard bituminous-coal trade dullness prevails as it has for some time past. A revival in the demand for steam coal was expected in some quarters in January, but these prophets are now postponing the good times for 60 days longer. The fact is that manufacturers are not buying with any degree of freedom in the East, and seem to be satisfied with enough to meet their immediate needs. Talk of season contracts is heard, but nobody seems disposed to start the business, and little or nothing will be done on this line for a month or more to come.

The anthracite trade is quiet. Some of the large companies are cutting off one or two days' work a week from the working time at the collieries; others are running full time, but not pushing work. Shipments continue and it is still evident that a good deal of coal is being stored.

In the West there are more signs of revival, though business in steam coal continues rather slow. There has been cold weather throughout the week, however, and from most consuming centers a better demand for household coal is reported. In Indiana mining time has been increased and many mines are running four days per week, with a few full time. In Illinois short time seems to be the rule. There is rather less complaint heard at the distributing centers of overshipments, notwithstanding the usual tendency of operators to load up the sidings at the large cities.

Coke business shows more hopeful signs than any other branch of the trade. Production in the Connellsville region is increasing from week to week, and the Pennsylvania Railroad reports larger shipments of coke than for a year past.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Jan. 11, 1908, and Jan. 9, 1909, in short tons:

	1908.	1909.	Changes.
Anthracite	123,320	63,216	D. 60,104
Bituminous	985,266	784,448	D. 200,818
Coke	193,973	253,625	I. 59,652
Total	1,302,559	1,101,289	D. 201,270

The total tonnages give daily averages of 118,415 tons in 1908, and 122,365 tons this year.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, 11 months ended Nov. 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	20,535,661	2,771,487	23,307,148
Buff., Roch. & Pitts.	4,982,888	300,353	5,283,241
Buff. & Susqueh'na	1,059,525	185,847	1,245,372
Penn. lines, N. Y. C.	6,170,610	65,414	6,236,024
Pitts. & L. Erie	7,502,114	2,702,832	10,204,946
Norfolk & Western	10,194,955	1,752,261	11,947,216
Total	50,445,753	7,778,194	58,223,947
Total, 1907	61,795,402	13,092,432	74,887,834

The total decrease this year was 16,663,887 tons, or 22.3 per cent. In addition to the above, the Baltimore & Ohio carried 941,612 tons anthracite in 1907, and 719,681 in 1908; decrease, 221,931 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, 11 months ended Nov. 30, short tons:

	1907.	1908.	Changes
Hocking Valley	3,826,978	3,033,023	D. 793,955
Toledo & Ohio Cent.	1,688,748	1,473,228	D. 215,520
Baltimore & Ohio	2,100,377	1,319,549	D. 780,828
Wheeling & L. Erie	3,213,825	2,493,773	D. 720,052
Cleve., Lorain & Wh.	2,736,986	2,217,064	D. 519,922
Zanesville & Western	1,455,471	1,180,104	D. 275,367
Toledo Div., Pen. Co.	2,081,111	1,410,128	D. 670,983
L. Erie, Alliance & Wh.	1,149,587	986,756	D. 162,831
Marietta, Col. & Clev.	34,752	50,791	I. 16,039
Total	18,287,835	14,164,416	D. 4,123,419

The total decrease shown in 1908 was 22.5 per cent.

Coastwise shipments of coal from chief Atlantic ports, 11 months ended Nov. 30, long tons:

	Anthracite.	Bitum.	Total.	Per Ct.
New York	13,698,715	9,244,744	22,943,459	62.6
Philadelphia	1,951,031	4,254,843	6,205,874	16.9
Baltimore	228,206	3,337,890	3,566,096	9.7
Newp't News	.....	2,480,609	2,480,609	6.8
Norfolk	.....	1,471,884	1,471,884	4.0
Total	15,877,952	20,789,970	36,667,922	100.0
Total, 1907	17,747,371	22,524,791	40,272,162	.....

Total decrease in 1908 was 3,604,240 tons, or 8.9 per cent. New York includes all the New York harbor shipping points.

Shipments of coal by water from Seattle and Tacoma, Wash., 11 months ended Nov. 30, were 657,334 tons in 1907, and 454,784 in 1908; a decrease of 202,550 tons. These shipments are chiefly to California and Alaska ports.

Coal receipts at St. Louis 11 months ended Nov. 30 were 7,413,151 short tons in 1907, and 6,268,039 in 1908; decrease, 1,145,112 tons.

The coal shipments reported by the Southwestern Interstate Coal Operators' Association for the year 1908 are, in short tons:

Missouri	2,416,201
Kansas	5,178,933
Arkansas	1,887,328
Oklahoma	2,686,808
Total	12,169,270

The total in 1907 was 14,656,338 tons, showing a decrease in 1908 of 2,487,068 tons, or 17 per cent.

New York

Anthracite

Jan. 20—The hard-coal market must still be reported very dull. The sharp cold weather which came with the opening of this week has not lasted long enough to have any marked influence on the trade. Domestic sizes are selling slowly. In steam sizes there is a little more activity, but nothing beyond the usual demand. All sizes are in good supply.

Prices are unchanged. The list prices for prepared sizes are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam sizes are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor points.

Bituminous

The soft-coal market is dull, no new demand for steam coal having developed. The far East is taking no coal and along the Sound deliveries are light with no new orders, or at least very few. New York harbor business is extremely dull and prices are nominal at $2.45@2.65 New York harbor for good grade Clearfield. Off grades are offered lower. All-rail business is slow and the snow and ice storm of this week has interfered a little with transportation.

In the Coastwise trade there is nothing doing. Freight rates are nominal at about the same as last week. The stormy weather has interfered with this trade and vessels are not anxious to clear just now.

Birmingham

Jan. 18—There is need for more coal, and the output has been steadily improving since the first of the year. The railroads are handling coal promptly. In addition to the increasing needs of some of the larger consumers, the coke production is being pushed. The coke supplies are now somewhat better than the demand, but several furnaces are to be blown in soon, while foundries and machine shops are starting up that will require all the coke that can be furnished.

Chicago

Jan. 18—Owing to cold weather the market for domestic coals remains good, and steam coals show no weakening. Western coal has moved steadily as fast as it has been received, leaving little ground for complaint about demurrage

charges, although on some consignments these charges have cut prices to the extent of 10 or 25c. on Illinois lump. Fine coals are firmer in tone, and the whole market shows improvement for products of Western mines. Eastern coals in general share in the improvement, but smokeless continues depressed because of large receipts that force low prices.

Illinois and Indiana coals bring $2@2.65 for lump and egg, $1.65@1.75 for run-of-mine, and $1.30@1.65 for screenings. On smokeless lump and egg quotations run $3.15@3.65 for Pocahontas and New River lump and egg, and $2.75@3.15 on run-of-mine, with lower grade smokeless $3.05@3.55 for lump and $2.75@2.95 for run-of-mine. Hocking holds up well to the $3.15 list price. Youghiogheny is quiet at $3.15 for ¾-in. gas. Pittsburg No. 8 is in somewhat large supply and brings $2.70@2.85 per ton.

Anthracite is in good demand in city and country, with practically no shading of prices for independent coal, and with no trouble about supplies.

Cleveland

Jan. 19—Receipts at Cleveland by rail in December included 87,411 tons anthracite, 266,326 tons bituminous coal and 76,173 tons coke. Practically none of the anthracite or coke was forwarded, but during the first days of the month 49,972 tons of bituminous coal were reshipped by Lake.

Steam trade is quiet, and the recent demand for slack seems now to be about over. Cold weather has started up a better demand for domestic coals. The market as a whole, however, must be called quiet, almost dull.

Indianapolis

Jan. 18—Here and there are signs of improvement in the coal trade. This is partly due to the coming of severe cold weather, starting domestic demand up with a rush. In Sullivan county, for instance, news comes of the adoption of a five-day weekly schedule for a number of mines and the lengthening of the schedules in others. The mines are now in better condition, financially, than any time since the spring of 1908. Mines that have been running only one and two days in the week are now running three and four days. A few are operating six days.

Pittsburg

Jan. 19—The rivers reached a coal-boat stage on Saturday and Sunday and nearly 2,000,000 bu. were shipped to St. Louis and New Orleans. There is still a barge stage but little coal is going out. A good rise is expected later in the week, when efforts will be made to get out all the coal loaded in the pools and harbors. Many empty barges arrived and were immediately sent to the mine tipples in the upper pools of the Monongahela river. As a result all the idle mines along the river resumed operations yesterday. The railroad mines are being operated at around 60 per cent. The demand is not strong, but prices remain firm on the basis of $1.15 a ton for mine-run coal at mine. There is some slight shading of this rate by small independent concerns, but the large operators are determined to maintain the price. A start has been made at the Marianna mine of the Pittsburg-Buffalo Company where the serious explosion occurred last month. About 50 men are working in each shift, and it is proposed to increase the number gradually.

Connellsville Coke—A decided slump in spot furnace coke prices is noted and sales have been made as low as $1.50; it is reported that one sale was at $1.35 a ton at ovens. Large producers are holding firmly for $1.75 for spot and $1.90@2 on contract for the first half. Foundry coke has not dropped materially and for spot shipment it will be difficult to do less than $2.10. On contract, quotations continue at $2.25@2.40 a ton at ovens. The *Courier* gives the production at 265,158 tons. Shipments were 9179 cars as follows: To Pittsburg district, 3406; to points west of Pittsburg, 5101; to points east of Connellsville, 672 cars.

Foreign Coal Trade

German Coal Production—Coal production of the German Empire, 11 months ended Nov. 30, metric tons:

	1907.	1908.	Changes.
Coal	131,393,100	136,729,987	I. 5,336,887
Brown coal	56,853,293	60,934,889	I. 4,081,596
Total mined	188,246,393	197,664,876	I. 9,418,483
Coke made	20,025,165	19,537,382	D. 487,783
Briquets made	15,043,430	16,813,871	I. 1,770,441

Of the briquets made in 1908 there were 13,101,439 tons, or 77.9 per cent. of the total, made from brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, 11 months ended Nov. 30, metric tons:

Imports:	1907.	1908.	Changes.
Coal	12,549,210	10,745,167	D. 1,804,043
Brown coal	8,163,446	7,920,938	D. 242,508
Total coal	20,712,656	18,666,105	D. 2,046,551
Coke	538,739	518,588	D. 20,151
Briquets	175,030	176,923	I. 1,893
Exports:			
Coal	18,115,184	19,192,539	I. 1,077,355
Brown coal	20,039	25,449	I. 5,410
Total coal	18,135,223	19,217,988	I. 1,082,765
Coke	3,471,671	3,315,691	D. 155,980
Briquets	1,126,539	1,381,559	I. 255,020

The coke exports in 1908 included 25,075 tons to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co. London and Cardiff, report current prices of coal as follows, on Jan. 8: Best Welsh steam, $3.48; second, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $2.04; seconds, $1.74. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Jan. 20—The iron and steel markets in general, while they show no signs of the widespread activity which was predicted for January, are nevertheless improving a little. The advance, however, is very slow.

In pig iron the inquiry is better and orders are reported to be coming in. They are mostly small, however, indicating that the foundry people are still satisfied to supply their immediate needs and have not in sight as yet business enough to warrant them in placing large contracts. Forge iron is dull, and basic pig is only in moderate demand. Prices of pig generally are rather uncertain. Some furnaces have talked of advances, but find that the only result is to check orders.

In finished material—with the exception of structural steel—business is also generally on a small scale. Orders do not come in with any degree of freedom except for moderate quantities. The railroads are still out of the market so far as rails are concerned, though they are placing some orders for bridge work. In structural steel more is doing than in any other branch. In the Eastern cities orders for buildings are being placed, some of them of fair size. The whole makes a very good aggregate tonnage. It is observed that the large fabricating companies in New York and elsewhere are taking contracts which would seem to imply the purchase of steel from the mills at 1.25 or 1.30c. if a profit is to be figured out. This is from 0.40 to 0.50c. below the tidewater prices of beams and other structural material.

Shipments of iron ore from the Lake Erie docks to furnaces are still reported as slow. The docks are generally congested, and unless there is a very considerable movement between now and May 1 they will not be ready to receive shipments from the upper Lake ports.

Baltimore

Jan. 19—The only exports noted for the week, besides copper, were 536,250 lb. scrap tin to Rotterdam.

Birmingham

Jan. 18—While the activity that is desired has not yet asserted itself, Southern pig-iron producers are selling iron right along and the aggregate is showing up well. One or two orders of some proportion have been booked in the Birmingham district recently, while numerous small orders, early delivery, are noted. The quotations hold strong at $13 per ton, No. 2 foundry. The furnace companies which have been sounding a 50c. advance do not report any business transacted. Some of the larger melters have again started an inquiry as to iron.

There is a large consumption of iron right in the Birmingham district. The

big steel plant of the Tennessee company is now on full in every department. The Bessemer rolling mill, belonging to the same concern is turning out finished iron and steel again. The cast-iron pipe concerns are all active, while foundries and machine shops show further improvement.

By Telegraph

Birmingham, Jan. 20—The Sloss-Sheffield Company sold today 20,000 tons of foundry iron to a leading cast-iron pipe plant on a basis of $13 per ton, first-half delivery. It is rumored here that the Alabama Consolidated Coal and Iron Company has bought the large plant of the Dimmick Pipe Company.

Chicago

Jan. 18—There is little activity in iron of any sort. Users of pig iron continue to buy in small quantities and for needs of the immediate future chiefly. Both buyers and sellers seem to have come to the conclusion to abandon contracts reaching any considerable distance ahead for deliveries, and inquiries are neither numerous nor for large tonnage. Despite this quietness the market has no indications of weakening, consumption being apparently well matched by production.

For the small lots that are being sold $13@13.50 Birmingham ($17.35@17.85 Chicago) for Southern and $17.50@18 for Northern are standard prices. Any considerable order could probably shade these quotations. Business is gradually resuming its normal tone following the holiday season, and the changes of the first of the year, and in sales of iron and steel products there are signs of increasing strength. Coke is somewhat stronger, with the best Connellsville in good demand at $4.90@5 Chicago.

Philadelphia

Jan. 20—Local consumers are making no effort to cover second quarter requirements for pig iron. There is no increase in shop or foundry work at present. Eastern furnace interests are not soliciting orders and a few makers have refused to sell at less than December prices. Inquiries have fallen off, except in a few instances for basic pig. Buyers claim that pig iron has not touched bottom and refer to the drop in Southern pig quotations during the past few days. At present an accumulation is in progress but makers express confidence in a heavy compensating demand which they think is liable to break out any time. Pipe works are ready to extend their orders but are insisting on lower prices. Some central Pennsylvania furnaces are again making very low offers for early delivery. Some special brands of Lehigh Valley iron are advanced 50c. nominally, but no sales have been made yet.

Steel Billets—Contracts of some magnitude have been closed for billets for 60 days delivery. Prices continue on the basis of former contracts.

Bars—All bar mills are doing a little more business and there is a gradual return to normal conditions. A few good sized orders have been placed this week but at a shading from current prices.

Scrap—The sales of scrap have been unimportant. Foundries are buying a little. Heavy melting steel scrap is pretty well cleaned up. Consumers are fairly well supplied. Prices are weak. Dealers are on the war path for heavy scrap to hold.

Pittsburg

Jan. 19—There has been no material improvement in the iron and steel trade. Tinplate leads the finished lines and production is being increased. The American Sheet and Tin Plate Company has started its American works, a 28-mill tinplate plant at Elwood, Ind., and last week was operating 160 mills, or about 75 per cent. of capacity. This was increased yesterday when several more mills at different plants were put on the active list. Most of the independent tinplate mills are running practically to capacity. When the spring trade opens it is certain production will be about normal. The same may be said of the wire trade. At present the American Steel and Wire Company is operating at around 80 per cent. of capacity and is booking many small orders. The Carnegie Steel Company yesterday started its Edgar Thomson rail plant in full, as in addition to receiving specifications on the Pennsylvania railroad order it has booked some foreign business. It is figured that the railroads will place orders for fully 3,000,000 tons, but of this there is no certainty. The structural-steel trade continues dull, but there are some important contracts in sight which are being delayed on account of the talk of a probable reduction in prices. Every consumer that enters the market is determined to get the lowest possible price and usually succeeds, the shading, however, being done entirely by independent mills.

Pig Iron—A number of important transactions in different grades of pig iron have been closed within the past two weeks, but for certain reasons the buyers insisted that no publicity be given to the contracts. One concern in the past 10 days sold over 10,000 tons of iron of various grades and at different prices. Another sold several lots of malleable bessemer, which is apparently the strongest grade. One lot calls for 1200 tons and is for early delivery and the price was $15.75. This price could not be duplicated for second-quarter delivery. A sale of 600 tons of No. 2 foundry for prompt delivery at $15.50 was made yesterday and another lot is under negotiation and may go at a lower price. Basic iron is not as strong as at the opening of the year, when $15.75 was named for first quarter, as a sale of several hundred tons was made within the past few days at $15.50. It is said that this price cannot be shaded. Standard bessemer is weak. The effort to hold first-half iron at $17 failed and now $16.50 is the quotation made by large producers. However, a sale of 600 tons was closed last week at $16.40. Gray forge is not in demand and is quoted nominally at $14.50. All prices are f.o.b. Valley furnaces.

Steel—In the crude-steel market most of the business is on old contracts. The price of $25, Pittsburg, is being firmly held for both bessemer and open-hearth billets. The announced price on plates continues at 1.60c., but there is still considerable shading. Merchant-steel bars remain firm at 1.40c.

Sheets—The sheet market shows improvement and production is being increased. Prices are firm, black sheets remaining at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—There is no demand, but prices are firm at $46@46.50, Pittsburg.

Foreign Iron

Scotch Iron Production—The Scottish Ironmasters' Association has issued the following statement for the full years given, in long tons:

	1907.	1908.	Changes.
Stocks, Jan. 1.....	90,548	96,043	I. 5,495
Make of pig.....	1,403,447	1,230,191	D. 173,256
Total.....	1,493,995	1,326,234	D. 167,761
Consumption.....	997,692	827,627	D. 170,065
Exports.....	400,260	312,562	D. 87,698
Total used.....	1,397,952	1,140,189	D. 257,763
Stocks, Dec. 31.....	96,043	186,045	I. 90,002

Of the exports in 1908, there were 142,830 tons to foreign countries and 169,732 to England and Wales.

Metal Market

New York, Jan. 20—The metal markets generally have been quiet, and no active revival of business is manifest as yet.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1908..	$ 7,358,707	$ 5,122,538	Exp. $2,235,169
" 1907..	1,004,441	44,448,515	Imp. 43,444,074
Year 1908..	71,215,456	50,246,099	Exp. 30,969,357
" 1907..	55,215,681	143,398,072	Imp. 88,182,391
Silver:			
Dec. 1908..	4,726,289	4,382,290	Exp. 343,999
" 1907..	4,413,698	4,222,036	" 191,662
Year 1908..	51,837,671	42,196,966	" 9,640,705
" 1907..	61,625,866	45,912,360	" 15,713,506

Exports from the port of New York, week ended Jan. 16: Gold, $5,930,000, chiefly to France; silver, $1,010,000, chiefly to London. Imports: Gold, $237,526; silver, $169,044, from the West Indies, Mexico and South America.

Foreign commerce of the United States, year ended Dec. 31, reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports	$1,923,426,205	$1,753,307,931
Imports	1,423,169,820	1,116,402,243
Excess, exports	$ 500,256,385	$ 636,905,688
Add excess of exports, silver		9,640,705
Add excess of exports, gold		30,969,357
Total export balance		$ 677,515,750

The gold and silver movement in detail is found in the table at the head of this column.

Gold—The price of gold in the open market in London fell off early in the week, but recovered later, 77s. 10½d. per oz. being paid for bar gold and 76s. 5½d. for American eagles. The Bank of France took most of the gold arriving from the Transvaal; but a total of $3,100,000 was shipped to Argentina. A shipment of $500,000 was also made to Argentina from New York.

Platinum—Prices still hold at $23.50@24.50 for refined ingot, $26.25 for hard and $20@21 for scrap, depending upon the quality. The refiners seem to be waiting for something to turn up. They are evidently uneasy as to what may happen in the future, and are inclined to push prices as high as they possibly can, with little buying in sight just now. Our last report from St. Petersburg is also to the effect that dealers there are holding back in expectation of higher prices. This appears to be over-optimistic, in view of the fact that there is not at present enough buying to keep the market stiff. In some well-informed quarters it is thought likely that the price will decline before making any further advance.

Silver—Silver advanced to 24⅜d. in London on Jan. 18 on active buying for the Indian bazaars, but closes at 23 15/16d. with a lower tendency. Selling by China banks caused the fall, and the market is quoted dull at the decline.

SILVER AND STERLING EXCHANGE.

Jan.	14	15	16	18	19	20
New York	52⅛	52⅛	52⅛	52⅞	52¾	52
London	24	24⅛	24⅛	24⅜	24⅛	23 15/16
Sterling Ex.	4.8745	4.8740	4.8740	4.8750	4.8740	4.8740

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Jan. 7, reported by Messrs. Pixley & Abell, London:

	1908.	1909.	Changes.
India	£ 207,500	£ 66,110	D. £ 141,390
China	61,000	.....	D. 61,000
Straits	.....	.....	.....
Total	£ 268,500	£ 66,110	D. £ 202,390

Receipts for the week were £4000 from Chile and £170,000 from New York; £174,000 in all.

Copper, Tin, Lead and Zinc

Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
14	14⅛ @14⅜	13⅞ @14⅛	61⅞	28⅛	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
15	14⅛ @14⅜	13¾ @14	61⅜	27¾	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
16	14⅛ @14⅜	13¾ @14	....	27¾	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
18	14 @14¼	13¾ @13⅞	60¼	27¾	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
19	14 @14¼	13⅝ @13⅞	60¾	27¾	4.15 @4.20	5.12½ @5.17½	4.97½ @5.02½
20	14 @14¼	13⅝ @13⅞	60¾	28	4.15 @4.20	5.12½ @5.15	4.97½ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Liquidation in the London market of some of the large speculative accounts, many of them originating from this side, to which we have previously referred, caused a break in the market for Standard. It has all along been feared that something of this kind would happen, and the situation is now clearer because of the liquidation of these accounts, which appears to have been inspired by the reports of large stocks of refined copper accumulated in this country, although some of these reports are greatly exaggerated. The lower prices established at London were immediately reflected in the quotations at which electrolytic copper was offered to domestic consumers. Though concessions have been made from day to day, such business as has been forthcoming either from Europe or from the home trade, has been only of a retail character. The market closes very unsettled at 14@14¼c. for Lake copper and 13⅝@13⅞c. for electrolytic. Casting is nominally 13⅜@13⅝ cents.

Copper sheets, cold-rolled, 20c.; hot-rolled 19c. per lb., base. Copper wire, 15¾c. base, carload lots at mill.

The London market broke sharply every day of the week, until Tuesday morning, when £59 12s. 6d. for spot and £60 10s. for three months was touched. From this point there was a feeble rally, and the close is easy at £60 7s. 6d. for spot and £61 5s. for three months.

Refined and manufactured sorts we quote: English tough, £64; best selected, £63@64; strong sheets, £75@76.

The disparity between the New York and London markets was such on Monday last that cathodes could be bought in London out of storehouse and be delivered in New York at 13½c. per lb., while the price here was 13¾c. However, it is improbable that any such return movement will occur, the chances being that the disparity will be removed by a rise in the London price, or a fall in that of New York.

Exports from New York and Philadelphia for the week are reported at 4213 long tons copper. Our special correspondent gives the exports from Baltimore at 801 long tons.

Imports and exports of copper in Germany, 11 months ended Nov. 30, metric tons:

	1907.	1908.	Changes.
Imports	120,753	147,114	I. 26,361
Exports	9,813	8,034	D. 1,779
Net imports	110,940	139,080	I. 28,140

The increase in net imports in 1908 was 25.3 per cent.

Tin—The firmer tone which London reported middle of last week was not maintained, and the market relapsed into dullness. Transactions were of small volume at declining prices. At the close, quotations reacted somewhat and are cabled at £126 15s. for spot and £128 12s. 6d. for three months.

Consumers in this market are attracted by the lower prices and are showing some interest. So far, large transactions, however, have not taken place. The market is quoted at about 28 cents.

Arrivals of Bolivian tin ores and concentrates—chiefly concentrates—in Europe for the 12 months ended Dec. 31 are reported 15,394 long tons in 1907, and 17,632 tons in 1908; an increase of 2238 tons.

Lead—There has been no change in the market, quotations being easy at 4.15@4.20c., New York.

The London market presents no new features and closes unchanged at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—There is a little more pressure to sell, and as the demand is of small proportions prices have eased off somewhat, and close at 5.12½@5.15c., New York, and 4.97½@5c., St. Louis.

The London market is also somewhat lower, and quotations are cabled at £21 2s. 6d. for good ordinaries, £21 7s. 6d. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is quiet, with little doing in the way of sales. Quotations are a shade lower, at 8⅛@8¼c. for Cookson's; 8@8½c. for Hallett's; 7½@7⅝c. for ordinary brands.

Aluminum—There is no change in the condition of the market. The European situation is still demoralized, prices being down to the cost of production. Foreign

aluminum has been sold in New York at 21½c. per lb. for ingots. The Aluminum Company still quotes 24c. base for No. 1 ingots and 33@34c. base for sheets.

Some large bids have recently been made for aluminum wire in electrical work. A contract for transmission wire for a Manitoba power company which would require 1,350,000 lb. of copper wire has been taken by the Aluminum people at a price not made public. Deliveries on this contract will extend over some time. Another contract in Massachusetts, which would take 450,000 lb. of copper wire, has also been taken by the Aluminum people.

Quicksilver—The market is quiet. New York quotations are $45@46 per flask of 75 lb., showing no change. San Francisco prices are $45@46 for domestic orders, and $43@44 for export. London quotation is £8 7s. 6d. per flask, with £8 6s. 3d. named by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. These quotations are for spot nickel. The price for electrolytic is 5c. higher.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, 12 months ended Dec. 31, figures in long tons, except quicksilver, which is in pounds:

	Imports.	Exports.	Excess.
Copper	166,348	68,866	Imp. 97,482
Copper, 1907	129,061	66,375	Imp. 62,686
Tin	47,730	42,096	Imp. 5,634
Tin, 1907	43,794	35,435	Imp. 8,359
Lead	237,518	49,464	Imp. 188,054
Lead, 1907	204,695	43,372	Imp. 161,323
Spelter	108,519	8,417	Imp. 100,102
Spelter, 1907	109,172	6,553	Imp. 102,619
Quicksilver, lb.	3,270,412	1,676,167	Imp. 1,594,245
Quicksilver, '07	2,958,603	2,209,439	Imp. 748,664
Ores:			
Tin ore and con.	25,013	.....	Imp. 25,013
Tin ore, 1907	20,871	.....	Imp. 20,871
Pyrites	759,910	.....	Imp. 759,910
Pyrites, 1907	769,141	.....	Imp. 769,141

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1908 the United States furnished 7068 tons copper matte, 56,138 tons fine copper and 36,443 tons lead.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 16—The base price paid for zinc ore this week was $41@42.50 per ton of 60 per cent. zinc; no premium price is reported. For 80 per cent. lead ore $50 per ton was paid.

The shipment was largely reduced the past two weeks by temporary shutdowns for repairs by a number of the larger producers.

Hazel Green failed to report. There is included in the week's shipments 28,000 lb. from Mineral Point, 63,000 from Harker, 101,910 from Linden and 116,100 from Highland; in all 309,010 lb. zinc ore shipped in the previous week, but not then reported.

SHIPMENTS, WEEK ENDED JAN. 16

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	543,730	.....	151,700
Linden	346,150	.....	.....
Harker	338,450	.....	.....
Cuba City	177,250	.....	.....
Benton	163,290	60,000	.....
Strawbridge	88,000	.....	.....
Days Siding	83,000	.....	.....
Livingston	80,000	.....	.....
Mineral Point	28,000	.....	.....
Highland	175,700	.....	.....
Total	2,023,570	60,000	151,700
Year to Jan. 16	6,472,996	60,000	552,900

Shipped this week to the Platteville Separating Company, 367,650 lb.; to the Joplin Separator Works, from Rewey, 108,600 lb. zinc ore.

Joplin, Mo., Jan. 16—The highest price for zinc ore was $46, the base price being $44 and $43 for the bulk of the ore sold, with a few small bins sold at $42 per ton of 60 per cent. zinc, for sulphide ore. Silicate ore sold on a base of $19 per ton of 40 per cent. zinc, with sales as high as $24, on a flat bid. The average price, all grades, was $39.78. Lead advanced this week to $54.50 per ton, an increase of $2.

SHIPMENTS, WEEK ENDED JAN. 16

	Zinc, lb.	Lead, lb.	Value.
Webb City Carterville	2,479,990	355,050	$61,310
Joplin	599,340	79,680	15,681
Galena	517,230	62,920	12,498
Aurora	694,710	.....	9,881
Alba-Neck	395,180	49,310	9,579
Granby	528,160	1,700	8,998
Badger	314,760	.....	6,610
Quapaw	269,000	.....	5,111
Duenweg	213,190	10,060	4,736
Prosperity	159,480	16,850	3,787
Miami	206,050	.....	3,503
Spurgeon	100,580	61,780	3,275
Carl Junction	88,340	5,370	2,083
Cave Springs	76,520	.....	1,645
Carthage	65,980	.....	1,384
Sarcoxie	55,670	.....	1,197
Zincite	58,560	.....	1,171
Totals	6,822,740	642,720	$152,449
Three weeks	29,119,840	3,251,520	$648,105
Zinc value, the week,	$135,746;	3 weeks,	$565,618
Lead value, the week,	16,703;	3 weeks,	83,487

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	53.52	54.59
October	41.75	35.95	39.83	33.28	51.40	52.63
November	38.60	39.13	35.19	35.02	43.40	54.53
December	31.50	42.75	30.87	39.63	37.71	49.68
Year	$44.36	$36.63	$43.68	$34.31	$68.90	$53.93

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

The average price, all grades, was $51.96 per ton.

A snowfall of 12 in. last Monday, with 7 deg. below zero on Tuesday put a large number of mines out of business for the greater part of the week, and it is estimated that the output was only approximately 30 per cent. of normal. The shipment is the smallest in years. A number of producers declined to sell under a base price of $45, and the buyers seemed equally determined not to pay this price. This, with the heavy snow, made the shipment light. A large proportion of the ore shipped is from purchases of the previous week.

Chemicals

New York, Jan. 20—The market in general is steady with no changes of importance. Stock-taking is hardly completed yet, and buyers do not seem ready yet to do business beyond their immediate needs.

Copper Sulphate—Demand is fair and no shading is reported, there being little outside stuff on the market. Quotations are steady at $4.75 per 100 lb. for carload lots and up to $5 per 100 lb. for smaller parcels.

Arsenic—The market is dull, only a few small sales being reported. Quotations are 3½c. per lb. for white arsenic.

Nitrate of Soda—Comparatively little is doing in this article. Current quotations are 2.17½c. for spot and 2.12½c. for futures.

Mining Stocks

New York, Jan. 20—The general stock markets have been largely professional in their character, with outside dealing not at all heavy. Fluctuations have been moderate, the only considerable decline having been in Amalgamated Copper. This stock rallied a little at the close. There was nothing of importance to affect the course of the market seriously in either direction, and it was not specially interesting.

On the Curb there was a fair amount of trading in copper stocks, Cumberland-Ely being the leader. While prices were not strong, they held up better than might have been expected. In the first part of the week Standard Oil was forced down, but it rallied toward the close. The Cobalt stocks were in fair demand, and prices held well, with a good volume of trading. The Nevada stocks were not specially active.

Boston, Jan. 19—It has been a dull and monotonous market, and outside of a few exceptions price changes have been unimportant. The weakness of copper metal has had to do with this state of affairs, which, to say the least, is discouraging for the moment.

A slight upward movement occurred in some of the Lake Superior mines on reports of daily conferences between the Calumet & Hecla and Bigelow, or Osceola people. However, they came to naught and prices lost pretty much all the advance. Isle Royale, for instance, rose $2 to $26.50, but is back close to $25, and Osceola rose $4 to $134, losing all but $1 of it. Calumet & Hecla went off $10 to $660. Superior Copper had another bulge and crossed $40, with subsequent reaction to $39. Tamarack rose $4 to $84, losing part of the advance.

The Osceola Consolidated annual meeting has been further adjourned to Feb. 17, pending a decision by Judge Knappen. Copper Range is off $1.62½ for the week to $77.62½, and North Butte $1.50 to $79.50. Arizona Commercial fell from $37 to $35.62½; Butte Coalition from $26.25 to $24.75; Lake from $22.62½ to $21, and Utah Consolidated from $45.25 to $44. Wyandot touched $4, the highest price for some time. The talk of contest for control of the Daly-West mine has had no effect on the stock. National Mining stockholders have been assessed 40c. a share to pay off its indebtedness.

A factor of some importance is the demand for memberships in the Stock Exchange. Two transfers have been made lately and at record prices, namely, $37,000 and $38,000.

The Curb has been fairly active, but without any important feature. Several new mining securities have made their appearance there.

STOCK QUOTATIONS

NEW YORK	Jan. 19
Name of Comp.	Clg.
Alaska Mine	⅜
Amalgamated	79¼
Anaconda	47⅛
Balakiala	12 1/16
British Col. Cop.	8
Buffalo Mines	3⅛
Butte Coalition	24⅞
Colonial Silver	⅞
Cum. Ely Mining	8⅜
Davis Daly	2¾
Dominion Cop.	7/16
Douglas Copper	1¾
El Rayo	3 1/16
Florence	4⅜
Foster Cobalt	.56
Furnace Creek	.11
Giroux	8
Gold Hill	7/16
Goldfield Con.	8
Granby	104½
Greene Gold	¾
Greene G. & S	7
Greenw'r & D.Val.	‡.75
Guanajuato	2
Guggen. Exp.	180
Hanapah	.15
McKinley Dar.	.95
Miami Copper	14
Micmac	2
Mines Co. of Am.	1
Mitchell Mining	⅛
Mont. Sho. C.	1
Nev. Utah M. & S.	2 1/16
Newhouse M. & S.	5⅛
Nipissing Mines	10⅝
Old Hundred	1/16
Silver Queen	.98
Stewart	1/16
Tennessee Cop'r.	44½
Tri-Bullion	⅞
Union Copper	5/16
Utah Apex	6
Utah Copper	44¾
Yukon Gold	4¼

*Ex. Div. †Ex. Rights.

BOSTON	Jan. 19
Name of Comp.	Clg.
Adventure	9
Allouez	‡35
Am. Zinc	24¼
Arcadian	3
Arizona Com	36
Atlantic	16¼
Boston Con	15
Calumet & Ariz	114
Calumet & Hecla	‡665
Centennial	31¾
Con. Mercur	.31
Copper Range	77⅛
Daly-West	10
East Butte	7⅝
Franklin	15⅛
Greene—Can	11⅜
Isle Royal	25¼
La Salle	14⅞
Mass.	5⅜
Michigan	12⅛
Mohawk*	66
Nevada	18⅛
North Butte	79⅝
Old Colony	‡.60
Old Dominion	55¼
Osceola	131
Parrot	28¼
Quincy	93
Rhode Island	5
Santa Fe	12¾
Shannon	16¼
Superior	39
Superior & Pitts.	16⅛
Tamarack	‡78
Trinity	15⅛
United Cop., com.	‡14⅛
U. S. Oil	28⅛
U. S. Smg. & Ref.	44
U.S.Sm. & Re.,pd.	46⅛
Utah Con	44
Victoria	4⅞
Winona	5
Wolverine	150
Wyandotte	3⅛

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	38⅛
Am. Smelt. & Ref.	85⅝
Am. Sm. & Ref. pf.	102
Colo. Fuel & Iron	41
Federal M. & S., pf.	‡84
National Lead	77⅛
National Lead, pf.	‡107
Pittsburg Coal	‡13¼
Republic I. & S.	25⅛
Republic I. & S., pf.	86⅛
Sloss-Sheffield	78
Standard Oil	658½
U. S. Steel	52⅛
U. S. Steel, pf.	113⅜
Va. Car. Chem	45½

BOSTON CURB	
Ahmeek	141
Black Mt.	3 1/16
Chemung	19
Globe Con	6¼
Hancock	12
Helvetia	3¾
Keweenaw	4¾
North Lake	‡7⅛
Ojibway	14
Superior & Bost.	15⅝

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	Jan. 16	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.05
Center Cr'k	2.00	1.50
Cent. C. & C.	78.00	76.00
C.C. & C. pd.	81.00	79.00
Cent. Oil	105.00	100.00
Columbia	7.00	4.00
Con. Coal	21.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.25	.20
St. Joe	14.00	12.50

LONDON	Jan. 20
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	0 15 3
Esperanza	3 2 6
Tomboy	0 18 9
El Oro	1 2 6
Oroville	0 9 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Jan. 20
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.63
Best & Belcher	.75
Caledonia	.38
Challar	.28
Comstock	.29
Con. Cal. & Va.	.98
Crown Point	.85
Exchequer	.55
Gould & Curry	.29
Hale & Norcross	.45
Mexican	1.30
Ophir	2.00
Overman	.37
Potosi	.40
Savage	.54
Sierra Nevada	.50
Union	.69
Utah	.10
Yellow Jacket	1.37
TONOPAH STOCKS	
Belmont	.90
Extension	.50
Golden Anchor	.01
Jim Butler	.16
MacNamara	.37
Midway	.24
Montana	.70
North Star	.03
Tono'h Mine of N.	5.87½
West End Con	.36
GOLDFI'D STOCKS	
Adams	.03
Atlanta	.15½
Booth	.26
Columbia Mt.	.17
Comb. Frac	1.17
Con. Red Top	.12½
Cracker Jack	.04
Dia'dfield B. B. C.	.09
Goldfield Belmont	.06
Goldfield Daisy	.68
Great Bend	.19
Jumbo Extension	.18
Kendall	.08
Lone Star	.06
May Queen	.04
N. Y. C. O. D.	.07
Oro	.11
Red Hill	.15
Roanoke	...
Sandstorm	.17

Name of Comp.	Clg.
Silver Pick	.10
St. Ives	.18
Triangle	.03
BULLFROG STOCKS	
Gibraltar	.03
Homestake King.	.08
Mont. Shoshone C.	1.00
Tramp Cons	.09
MISCELLANEOUS	
Bonnie Clare	.06
Lee Gold Grotto	...
Nevada Hills	1.50
Nevada Smelting.	1.25
Nevada Wonder	.35
Nevada-Utah	2.87½
Penn-Wyoming	.08
Pittsburgh S. Pk.	.80
Rawhide Coal	.50
Round Mt. Sphinx	.15

COLO. SPRINGS	Jan. 8
Name of Comp.	Clg.
Acacia	6½
Black Bell	....
C. C. Con	3½
Dante	6
Doctor Jack Pot	8½
Elkton	70½
El Paso	50¾
Findlay	15⅝
Gold Dollar	9⅛
Gold Sovereign	3¾
Isabella	24
Index	...
Jennie Sample	6
Jerry Johnson	‡4¾
Mary McKinney	38½
Pharmacist	‡3⅝
Portland	1.01
Un. Gold Mines	4½
Vindicator	80
Work	6¾

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev	Feb. 2	Feb. 23	$0.05
Andes, Nev	Jan. 8	Feb. 2	0.10
Caledonia, Nev	Jan. 8	Jan. 29	0.05
Chollar, Nev	Jan. 11	Feb. 3	0.10
Con. Imperial, Nev	Jan. 11	Feb. 3	0.01
Copper King, Ida	Dec. 10	Jan. 15	0.01
Exchequer, Nev	Dec. 30	Jan. 20	0.05
Federal-Ely, Utah	Jan. 9	Feb. 1	0.01
Iowa, Utah	Jan. 5	Feb. 2	0.02
Savage, Nev	Jan. 6	Jan. 28	0.10
Sierra Nevada, Nev	Feb. 12	Mar. 5	0.10
Silver King Con., Utah	Jan. 6	Jan. 26	0.10
Wabash, Utah	Jan. 7	Jan. 30	0.10
Yellow Jacket, Nev	Dec. 28	Feb. 3	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	49.647	27.154	22.933
December	54.565	48.769	25.362	22.493
Year	65.327	52.864	30.188	24.402

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.325	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	14.130	13.870	14.386	61.226	63.417
December	13.163	14.111	13.393	14.411	59.113	62.943
Year	20.004	13.208	20.661	13.424	87.007	59.902

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	29.144
			Av. year	38.160	29.465

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	4.330	17.281	13.538
December	3.658	4.213	14.500	13.156
Year	5.325	4.200	19.034	13.439

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	5.137	4.104	4.987	20.075	20.625
Year	5.962	4.726	5.812	4.578	23.771	20.163

New York and St. Louis, cents per pound. London in pounds sterling per long ton.